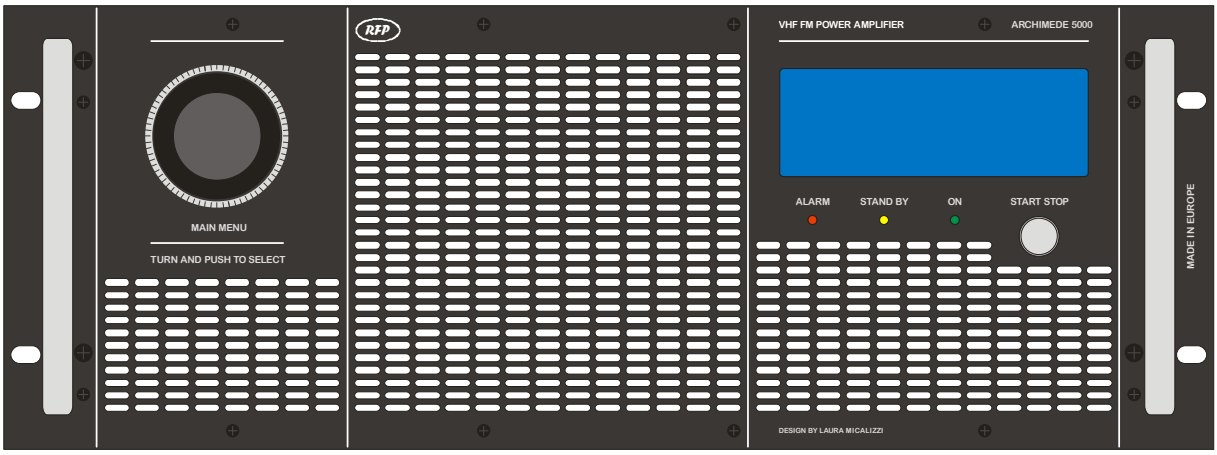
ARCHIMEDE

5000 Series

High Power FM Amplifier



Ultra-compact High Power FM Amplifiers
User's Manual

Revision 1.0

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Preliminary notes

We used the utmost care in making a complete manual with detailed, accurate and updated information, yet the contents herein cannot be regarded as totally binding towards our company.

Italab, in their constant commitment to improve the quality of their products, reserve the right to vary the technical features of the same without prior notice. For a full update please visit our web-site www.Italab.it or contact our local dealer or agent.

The manufacturer will not be held responsible for any consequence caused by errors or improper handling on which he has no direct control.

According to the requirements of our customers, the described options may vary from model to model.

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Italab Communications. hereby declares that the object of this manual complies with the requirements specified in the 1999/05/EC directive.

CE 0678

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17 ..... ERRORE. IL SEGNALIBRO NON È DEFINITO.

1 INTRODUCTION

Congratulations for your choice! **Archimede High Power** is a series of new-concept FM solid state (MOS-FET) amplifiers, available in three different models according to their rated output power (**Archimede 3000** → 3kW - **Archimede 4000** → 4kW – **Archimede 5000** → 5kW).

These systems are so compact they can be entirely fitted into a 19" 2 units rack 500 mm depth, making them the ideal solutions for medium and high power repeaters in unattended stations, in N+1 systems and also as spare amplifiers. These are only some of the state-of-the-art features that make the **Archimede High Power** series truly unique:

- **Ultra compact size and reduced weight.** (**Archimede 3000/4000**: 28kg, **Archimede 5000**: 35kg).
- **Thoroughly modular construction.** The R.F. amplifier is composed of ultra - compact new-generation internal modules (their number depends on the model). Such modules can be easily identified and inspected.
- **High reliability.** Thanks to the internal balance circuits, in case one of the internal modules fails, the other modules left are automatically re-balanced, thus to continuing the operation at reduced power.
- **Better reliability.** Per each model the rated output power is reached at nearly the 80% of the maximum output power the equipment could generate.
- **Low operation costs.** The special care taken in the design, aimed at minimizing internal losses, allows a very high electrical efficiency to be achieved thus minimizing power consumption and thereby reducing operation costs.
- **High ventilation and low heat sinking.** The reduced internal losses and high overall efficiency minimize heat sinking. As a result, the size of the internal ventilation system can meet even the most demanding environmental conditions.
- **Large allowable bandwidth and low maintenance requirements**.
- **Interactive control panel with LCD display.** Enables the user to easily set the equipment modes and commands and to display the operation parameters through the practical multifunction knob.
- **Sturdy modular mechanical and electrical construction.** It guarantees a high MTBF and an easy maintenance.
- **High efficiency.** To control the output power level the output power loop control adjusts first the power supply voltage of the MOS FET and, if it's not sufficient, it adjusts the Bias voltage.
- **Continuous control of the cooling fans speed.** This control allows a constant temperature of the amplifier heatsink, and a longer lifespan of the cooling fans.
- **Automatic reset when an active alarm ends.** When an active alarm ends, the equipment is able to automatically reset itself, without the need of human intervention.
- **Simple diagnostics and unambiguous parameters reading.** This is due to a comprehensive metering and alarm section on the control panel. Thanks to the optional external telemetry system, parameters and alarms are easily accessible from remote posts through the relevant remote control input.
- **Compliance with the strictest norms.** These equipments were designed in compliance with the tightest international norms, as well as the recent, strict anti-magnetic noise EC requirements. Besides, the equipments comply with the EC and ETSI 302.018-2 v 1.1.2.1 (2006-03) standards.

***Please note** that the manufacturer, in his continuous attempt to improve further the quality of his product, reserves the right to vary the technical features of the Falcon High Power models without prior notice.*

Warning! Before carrying out any operation, it is essential to read the whole of the present manual – with particular reference to Chapters 2 and 3 – in order to avoid damages to objects and people.

2 GENERAL INFORMATION

2.1 Safety suggestions

Regardless of how well electrical equipment is designed, personnel can be exposed to dangerous electrical shock when protective covers are removed for maintenance or other activities. Therefore, the user is obliged to see that all safety regulations are consistently observed and that each individual assigned to the equipment has a clear understanding of the first aid related to electrical shocks (see following pages).

IN ADDITION THESE SAFETY PRACTICES MUST BE FOLLOWED:

- Do not attempt to adjust unprotected circuit controls or to dress leads with power on.
- Always avoid placing parts of the body in series between ground and circuit points.
- To avoid burns, do not touch heavily loaded or overheated components without precautions.
- Remember that some semiconductor cases and solid-state circuits carry high voltages.
- Do not assume that all dangers of electrical shock are removed when the power is off. Charged capacitors can retain dangerous voltages for a long time after power is turned off. These capacitors should be discharged through a suitable resistor before any circuit points are touched.
- Don't take chances. Be fully trained. Italab (ITB) equipments should be operated and maintained by fully qualified personnel.
- Do not service alone and do not perform internal adjustments of these units unless another person capable of rendering first aid and resuscitation is present.
- Some components used in the construction of this equipment contain Beryllium Oxide (BeO). This substance is harmless as it is, but becomes highly dangerous if it's ground to powder. Special procedures of disposal must be observed in case of failure of these devices.

> **Note: This section is not intended to contain a complete statement of all safety precautions which should be observed by personnel in using this electronic equipment or others.**
>
> Italab Communications SHALL NOT BE responsible for injury or damage resulted from improper procedures or from using it by improperly trained or inexperienced personnel.

2.1.a General safety recommendations

When connecting the equipment to the power, please follow these important recommendations:

- These products are intended to operate from a power source that will not apply more than 10% of the voltage specified on technical specifications between the supply conductors or between either supply conductor and ground. A protective-ground connection by way of the grounding conductor in the power cord is essential for safe operation.
- According to the model, these units have to be grounded through the contact (GND) located on the rear panel or via the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired socket before connecting to the product input or output terminals.
- Upon loss of the protective-ground connection, all accessible conductive parts (including parts that may appear to be insulating) can render an electric shock.
- To avoid fire hazard, use only fuses of correct type, voltage rating, and current rating. Refer fuse replacement to qualified service personnel.
- To avoid explosion, do not operate this equipment in an explosive atmosphere.
- To avoid personal injury, do not remove the product covers or panels. Do not operate the product without the covers and panels properly installed.

2.1.b Good practices

In maintaining the equipment covered in this manual, please keep in mind the following, standard good practices:

- When connecting any instrument (wattmeter, spectrum analyzer, etc.) to a high frequency output, use the appropriate attenuator or dummy load to protect the final amplifiers and the instrument input.
- When inserting or removing printed circuit boards (PCBs), cable connectors, or fuses, always turn off power from the affected portion of the equipment. After power is removed, allow sufficient time for the power supplies to bleed down before reinserting PCBs.
- When troubleshooting, remember that FETs and other metal-oxide semiconductor (MOS) devices may appear defective because of leakage between traces or component leads on the printed circuit board. Clean the printed circuit board and recheck the MOS device before assuming it's defective.
- When replacing MOS devices, follow standard practices to avoid damage caused by static charges and soldering.
- When removing components from PCBs (particularly ICs), use care to avoid damaging PCB traces.

2.1.c First aid in case of electrical shock

If someone seems unable to free himself under electric shock contact, turn the power off before rendering aid. A muscular spasm or unconsciousness can make a victim unable to free himself from the electrical power.

If power cannot be turned off immediately, very carefully loop a length of dry non-conducting material (such as a rope, insulating material, or clothing) around the victim and pull him free of the power. Carefully avoid touching him or his clothing until free of power.

DO NOT TOUCH VICTIM OR HIS CLOTHING BEFORE POWER IS DISCONNECTED

OR YOU CAN BECOME A SHOCK VICTIM YOURSELF

2.1.d Emergency resuscitation technique

Step 1

Check the victim for responsiveness. If there is no response, **immediately call for medical assistance**, and then return to the person**.**

Step 2

Position the person flat on his back. Kneel by his side and place one hand on the forehead and the other under the chin. Tilt the head back and lift the chin until teeth almost touch. Look and listen for breathing.

Step 3

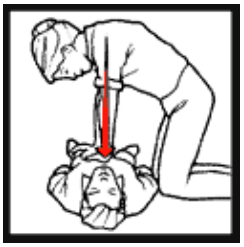
If not breathing normally, pinch the nose and cover the mouth with yours. Give two full breaths. The person's chest will rise if you are giving enough air.

Step 4

Put the fingertips of your hand on the Adam's apple, slide them into the groove next to the windpipe. Feel for a pulse. If you cannot feel a pulse or are unsure, move on to the next step.

Step 5

Position your hands in the center of the chest between the nipples. Place one hand on top of the other.



Step 6

Push down firmly two inches. Push on chest 15 times.

CONTINUE WITH TWO BREATHS AND 15 PUMPS UNTIL HELP ARRIVES

2.1.e Treatment for burns

- Continue treat victim for electrical shock.
- Check for points of entry and exit of current.
- Cover burned surface with a clean dressing.
- Remove all clothing from the injured area, but cut around any clothing that adheres to the skin and leave it in place. Keep the patient covered, except the injured part, since there is a tendency to chill.
- Splint all fractures (violent muscle contractions caused by the electricity may result in fractures).
- Never permit burned surfaces to be in contact with each other, such as: areas between the fingers or toes, the ears and the side of the head, the undersurface of the arm and the chest wall, the folds of the groin, and similar places.
- Transport to a medical facility.

2.2 Symbols used in this document

In order to allow a quick and essential reading, we used symbols which attract immediate attention, and which simply and efficiently advise and inform the user.

The symbol of the open hand, stresses a description of the highest importance, which concerns technical intervention, dangerous situations, security warnings, advice and/or information of the highest importance. If such symbol is not heeded, serious problems/consequences could arise.

The written notebook represents practical and important advice which we recommend to follow in order to obtain the best performance possible from the equipment.

The display messages (LCD pages, options, etc.) are written **`in this font`** `(bold Courier New).`

Important sentences and words are underlined.

For ease of reference, cross references to sections, chapters, page numbers, diagrams, etc. may be indicated using the ⇨ symbol. For example: "⇨Par.3.1" means "refer to paragraph 3.1"

3 WARNINGS

3.1 Safety first!

Before connecting or using these devices, carefully read all instructions contained in this manual, in the order in which they are written. Cross references to sections and chapters were created exclusively for ease of use. Keep this manual in a safe place for future reference.

IMPORTANT: Improper use or installation of these devices could cause serious damage to objects and people alike. Therefore, it is essential to rely on an installer who has been previously authorized or approved by ItalabBroadcasting, or by our local representative, and that both the user and the installer read the entire manual before carrying out any operation.

All warnings included in this manual must be strictly followed to avoid damages to both the device and the operator. Read and follow all instructions indicated on warning labels or affixed to the device and its accessories.

According to the model, the equipment can weighs up to about 35kg and should therefore be moved or carried exclusively with the proper equipment and the due caution.

Do not turn the equipment on without having duly wired and connected it, as explained in chapter 7.

Always follow the laws and regulations stipulated regarding the use of broadcast transmitters, as in effect in the geographical area in which you are operating.

The amplifier output power must be exclusively adjusted through the amplifier menu and NOT through any other way, such as the driving power. If this rule is not followed the equipment could get damaged. In case of specific needs, please contact Italab.

As the equipment software is regularly updated, some of the screenshots or commands described in this manual might be slightly different than those will actually appear on your device. In case of doubts, promptly contact Italab.

Warning! When connecting the Archimede 5000 or Archimede 4000 to the power line please read carefully the paragraph 7.4.c "Connection of the Archimede 4000 or Archimede 5000 power supply cable" to avoid damages to equipment and people.

4 MODEL IDENTIFICATION

The features of the Archimede High Power series FM amplifiers (such as the commands on the front panel) are common to all models. Nevertheless each one of them differs in the output power and other standard or optional specs that make it unique. This is why it's mandatory checking the exact model of the equipment in use.

There are several ways to recognize the model of your equipment. The following table resumes the differences between Archimede 3000, Archimede 4000 and Archimede 5000:

Ref.	Archimede 3000	Archimede 4000	Archimede 5000	Notes
Model name on the front panel	"Archimede 3000"	"Archimede 4000"	"Archimede 5000"	⇨ Par. 5.1, part # [1]
Label on the rear panel	"Archimede 3000"	"Archimede 4000"	"Archimede 5000"	
R.F. Output connector	7/16 flange*	7/8 flange		⇨ Par. 5.2, part # [17]
Number of fans on the rear side	2		3	⇨ Par. 5.2, part # [17]
Number of power supply units	2**	3		⇨ Par. 5.3, parts # [25] and [26]
R.F. splitter (Wilkinson type)	3-ways	4-ways		⇨ Par. 5.4, part # [30]
R.F. amplifier modules number and power	3 x 1.300W	4 x 1.300W	4 x 1.500W	⇨ Par. 5.4, parts # [31], [32], [33], [34]
R.F. combiner (Wilkinson type)	3-ways	4-ways		⇨ Par. 5.4, part # [35]
Number of fuses protecting the amplifier modules	6	8		⇨ Par. 5.4, parts # [39], [40] and Par.6.4.c

* 7/8 rigid line flange can be required as optional

** Archimede 3000 can be optionally supplied for a three-phase power supply (⇨ Par. 6.1). In this case the equipment mounts three power supply units (for the installation see the information given in paragraph 7.4.c).

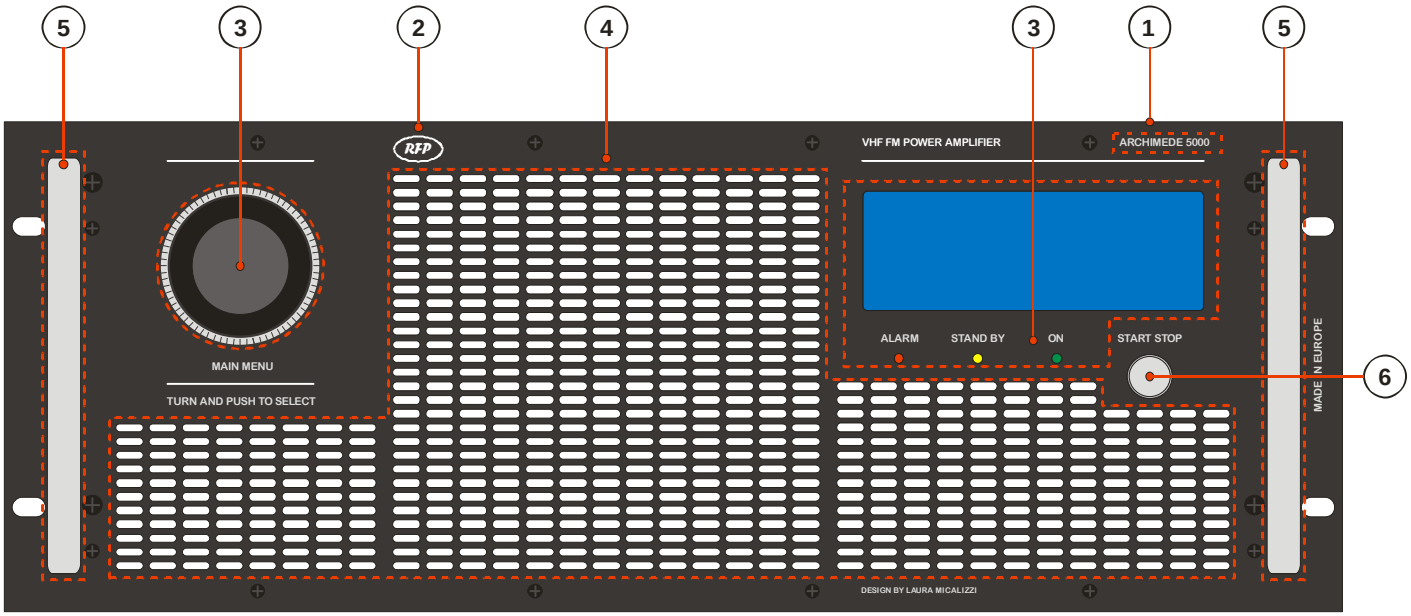
In order to avoid misunderstandings of the operating instructions, it's very important to verify the exact model of the equipment and keep it in mind.

5 PARTS DESCRIPTION

If not otherwise specified, the following descriptions are valid for all Archimede High Power models.

5.1 Front view

Please see the following images to spot and identify the equipment parts and get familiar with them:



[1] **Model** – This label quotes the model of the equipment (e.g.: the image refers to Archimede 5000).

[2] **RF MONITOR (Option)** – SMA - type connector for sourcing the low level RF signal. This function is useful for measurements with external instruments. The signal attenuation is 50 dB.

RF MONITOR output does not guarantee an output level that is perfectly constant versus frequency. As such, it cannot be used for accurate spectrum measurements.

[3] **Control panel** – allows the user to set device functions, and to view and set operating parameters. For further details ⇨5.1.a.

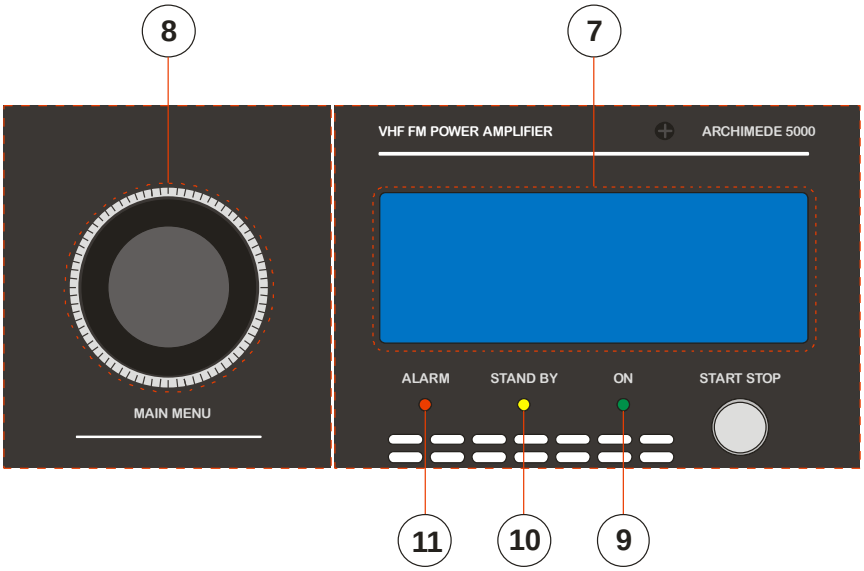
[4] **Front ventilation grid** – allows the device to draw in the cooling air into the equipment.

[5] **Front handles** – allow the user to easily carry the device.

[6] **ON/STAND-BY** button – allows switching the equipment between the operating (ON) condition and the stand-by one. To get the command working, keep this button pressed for at least two seconds.

5.1.a Control panel

The control panel commands are the followings:



[7] **LCD (Liquid Crystal Display) –** this display, composed of 4 lines of 20 characters, shows the operation parameters and functions selected through the multifunction knob.

[8] **Multifunction knob (digital encoder) –** it allows the user to navigate through the command menu in various ways.

- If turned – selects the various functions/operations for the device, or the parameter values to be set
- If pressed (for a short time like a button) when inside the menu, it activates the currently selected option.

For further information regarding the use of the multifunction knob ⇨9.1.

[9] **ON LED** - this LED glows green when the equipment is in normal operation.

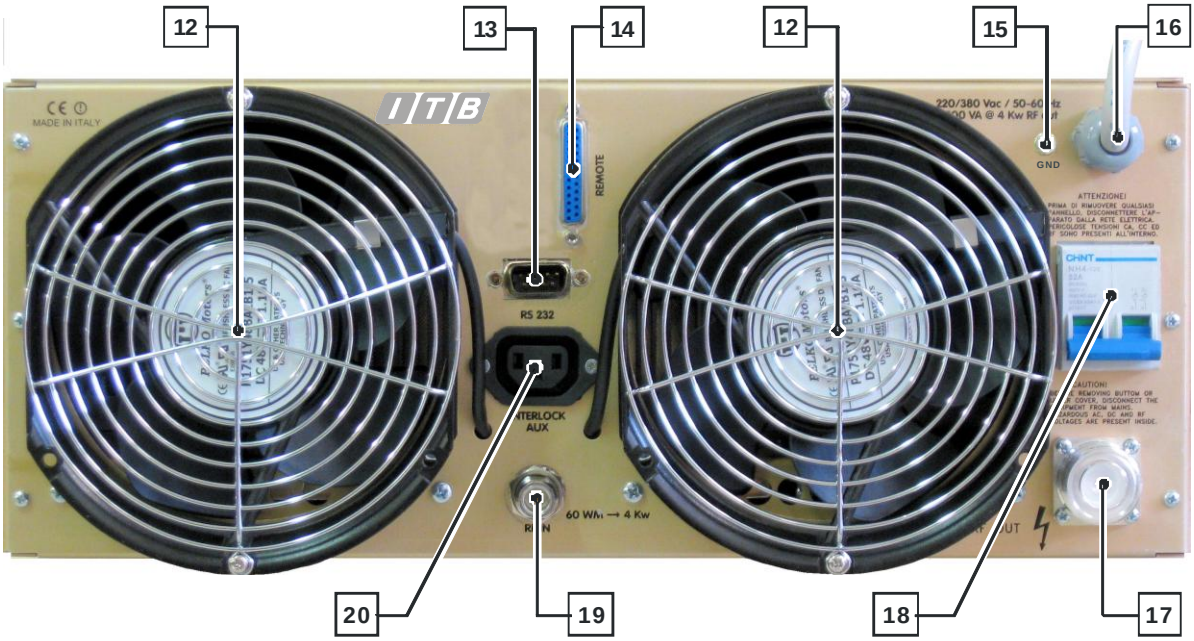
[10] **STAND-BY** LED - this LED glows yellow when the equipment is in stand-by mode. In this condition, the amplifier can't temporarily deliver output power until it's reverted back into operation mode through the **ON/STAND-BY** button [6].

[11] **ALARM** LED - this LED glows red if an alarm event occurs.

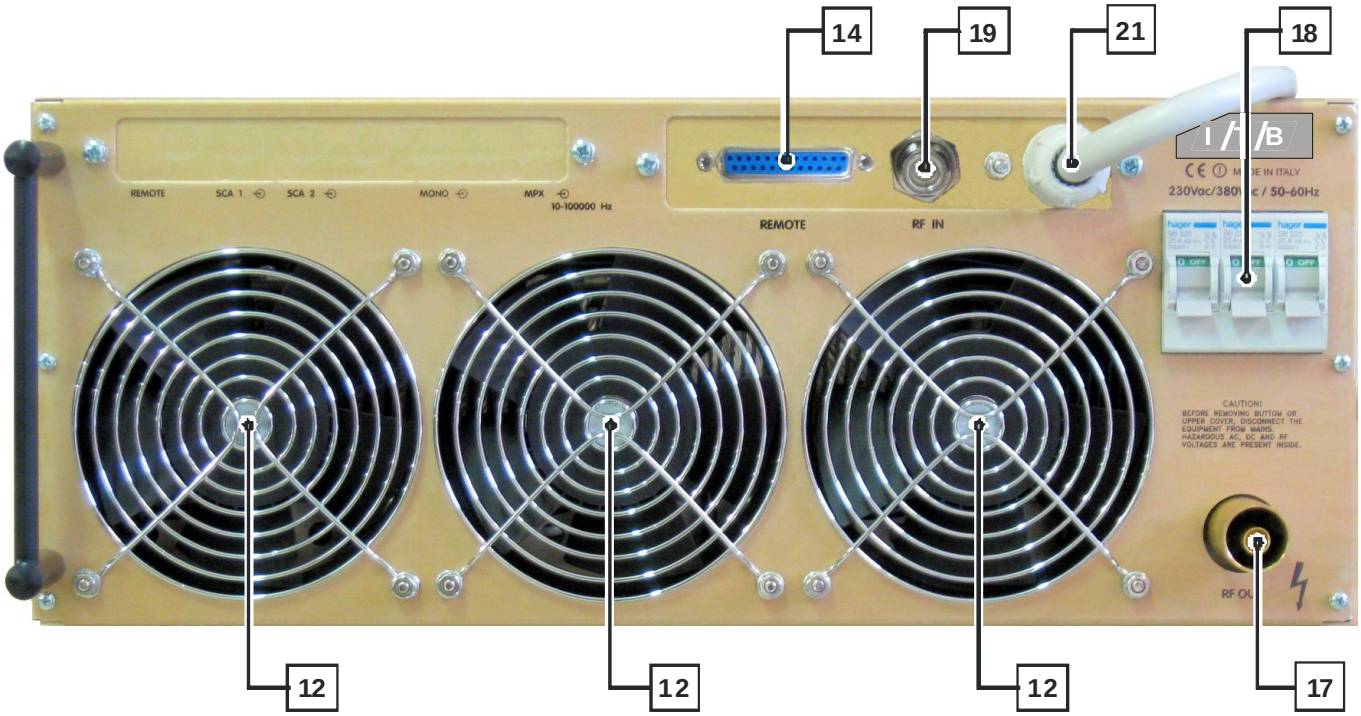
The combination of these 3 LEDs can also show if an alarm has been issued. For further information please refer to par. 13.1.

5.2 Rear view

Archimede 3000 and **Archimede 4000** rear view (standard version, for the connection to a single-phase 230V_{AC} power line):



Archimede 5000 rear view:



[12] **Exhaust cooling air outlet** – the exhaust cooling air which came into the equipment through the front ventilation grid exits from this outlet

[13] **RS 232** connector – optional, for the connection to an external modem. Only with Archimede 3000 and 4000.

[14] **REMOTE** – DB25 female connector, used when the amplifier is equipped with the optional Telemetry board.

[15] **GND** (ground) – It allows the connection of the equipment to ground for a safe operation.

When installing Archimede 5000 or Archimede 4000 models make sure to earth the equipment through the ground wire of the power supply cable (⇨7.4.c).

[16] **Power Supply cable** – Archimede 3000 standard model can be connected to a single-phase 230V_{AC} power line. Archimede 4000 can be connected to a single-phase 230V_{AC}, to a three-phase 220V_{AC} or to a three-phase with neutral wire 400V_{AC} power line.

For details about the Archimede 4000 power supply connections ⇨7.4.c

On demand, Archimede 3000 can be supplied for the connection to a three-phase with neutral wire 400VAC power line

[17] **RF OUT** (50 OHM) – an FM broadcasting suitable antenna able to bear the amplifier rated power must be connected to this flange.

***Archimede 3000** is default supplied with a 7/16 connector. On demand, it can be supplied with a 7/8 flange.*

***Archimede 4000** and **Archimede 5000** are default supplied with a 7/8 flange complete with a 7/8 rigid line flange. This is a quite useful solution when carrying out maintenance operations (e.g.: fans maintenance), because it's not necessary to unsolder the 7/8 rigid line connector, being sufficient to loosen a clip to get the equipment free and removable from the rack (clearly after having removed all the other connections).*

[18] **Power ON/ OFF** – it enables to switch on/off the equipment (main power supply).

[19] **RF IN** – The exciter must be connected to this N type connector.

Do not exceed the maximum driving input power levels given in the following table:

Maximum Driving Input Power levels		
Archimede 3000	Archimede 4000	Archimede 5000
35W	**50W**	**60W**

[20] **INTERLOCK AUX** – when installing Archimede 3000 or Archimede 4000 connect the power supply input of the exciter to this VDE female connector.

This solution acts as an interlock command managed by the amplifier control board which can decide, in case of an active critical alarm, to switch off the exciter.

[21] **Power supply cable** – Archimede 5000 comes with a 7 x 1.5 mm^2 (six poles + neutral wire) power supply cable, about 2 meters long.

Archimede 5000 can be connected to a single-phase 230V_{AC}, to a three-phase 220V_{AC} or to a three-phase with neutral wire 400V_{AC} power line.

For details about the Archimede 5000 power supply connections ⇨7.4.c.

5.2.a REMOTE connector

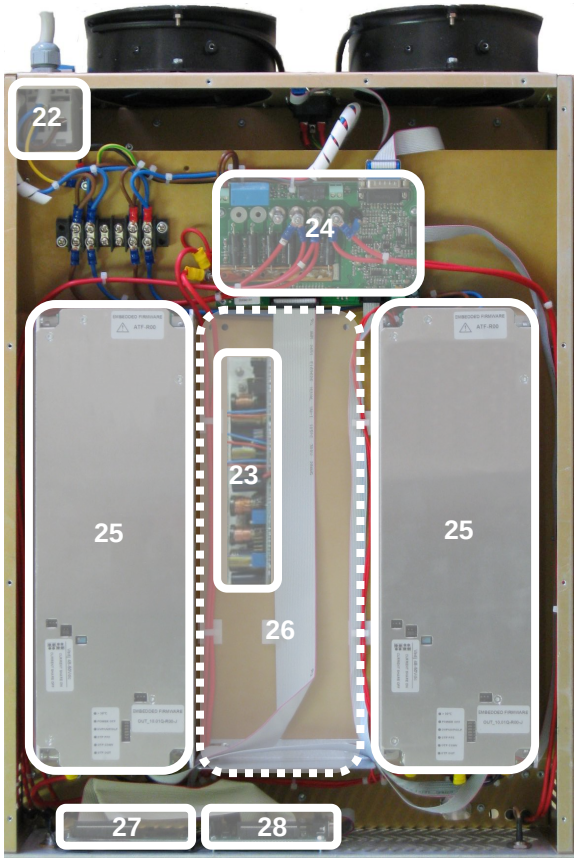
The **REMOTE** connector [14] gathers mainly information about the equipment status (alarms status and internally carried measures). The following table describes these I/O signals:

Pin	Signal	Description/Notes
1	-	(not connected)
2	High reflected power alarm	If this status is reached, the output on this pin is +12V_{DC}.
3	-	(not connected)
4	Direct power measure	Range from 0 to 2V_{DC} (full range).
5	Reflected power measure	Range from 0 to 2V_{DC} (full range).
6	Low direct power alarm	If this status is reached, the output on this pin is +12V_{DC}.
7	Not connected	(not connected)
8	DC power supply	External 12 V_{DC} for service purposes (20mA Max)
9	-	(not connected)
10	Stand by	To set the equipment in stand by mode connect this pin to pin 8 or to an external +12V_{DC}.
11	Power adjustment input command	Range from 0 to 4V_{DC} (from 0W up to full output power).
12	Temperature alarm	If this status is reached, the output on this pin is +8V_{DC}.
13	-	(not connected)
14	-	(not connected)
15	-	(not connected)
16	-	-
17	-	-
18	-	-
19	-	-
20	-	-
21	-	-
22	-	-
23	-	-
24	-	-
25	-	-

5.3 Internal top view - main parts location.

Archimede 3000/4000

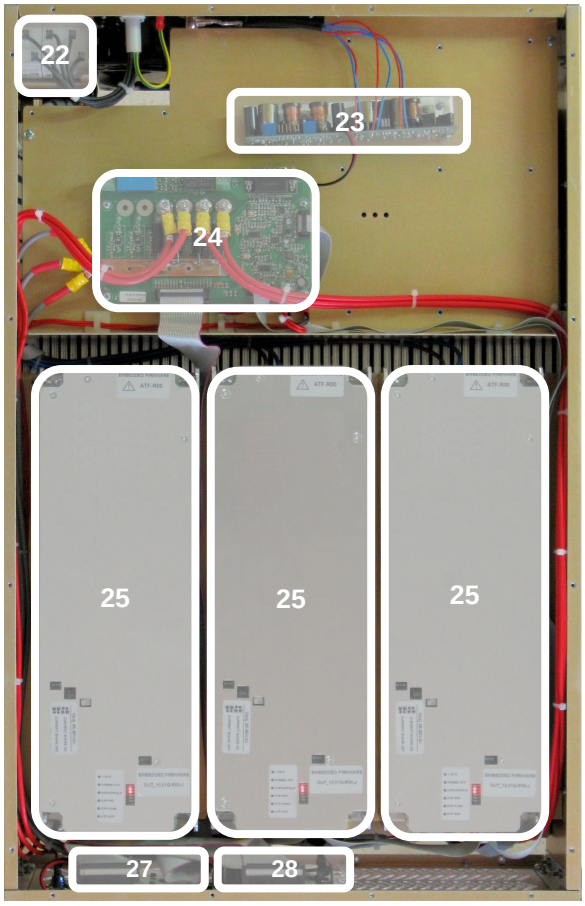
Rear side



Front side

Archimede 5000

Rear side



Front side

[22] **ON/OFF power switch**

[23] **Fans control board** (⇨Par.6.3).

[24] **Analog & controls board** (⇨Par.6.2).

[25] **Power supply board –** standard with all models (⇨Par.6.1).

[26] **Power supply board –** This space is fitted with a third power supply unit with Archimede 4000 standard version or with Archimede 3000 mounting the three-phase with neutral wire 400V_{AC} power supply option (⇨Par.6.1).

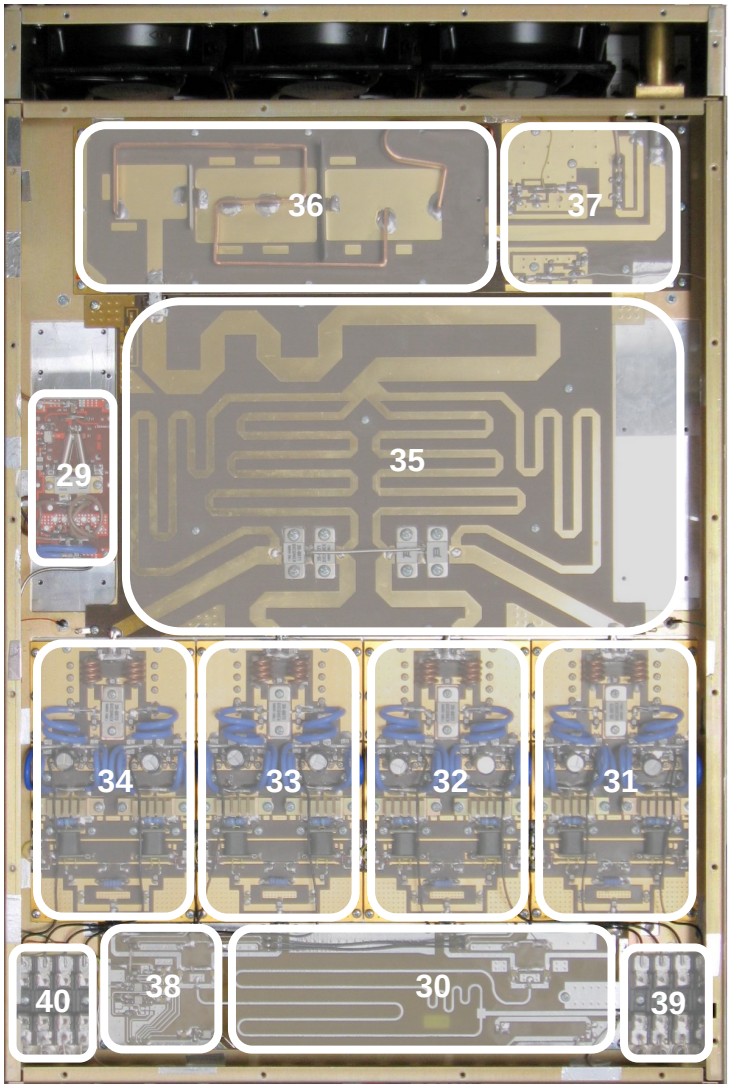
[27] **LCD display board** (⇨Par.6.5)

[28] **Digital encoder** – multifunction knob (⇨Par.6.6)

5.4 Internal bottom view (R.F. amplifier section) - main parts location.

If not otherwise specified, the following descriptions are valid for all Archimede High Power models.

Rear side



Front side

[29] **Driver amplifier** (⇨Par.6.4.a).
[30] **Wilkinson type splitter** (⇨Par.6.4.b)
[31] **Amplifier module # 1** (⇨Par.6.4.b).
[32] **Amplifier module # 2** (⇨Par.6.4.b).
[33] **Amplifier module # 3** (⇨Par.6.4.b).
[34] **Amplifier module # 4 –** this module is present only with Archimede 4000 and Archimede 5000 (⇨Par.6.4.b).
[35] **Wilkinson type combiner** (⇨Par.6.4.b).
[36] **Low-pass filter** (⇨6.4.b).
[37] **Directional couplers** (⇨Par.6.4.e).
[38] **Adjustment of the Input, Direct and Reflected power level readings** (⇨Par.6.4.d).
[39] **Fuses –** protection of the transistors mounted on the amplifier modules # 1 and 2 (⇨Par.6.4.c).
[40] **Fuses –** protection of the transistors mounted on the amplifier modules # 3 and 4 (the last one module is mounted only on Archimede 4000 and Archimede 5000) (⇨Par.6.4.c).

6 CIRCUITS DESCRIPTION

This section's sole purpose is to provide general explanations about the device operation in order to simplify the maintenance by skilled personnel appointed by Italab. As already mentioned, no internal adjustments are required for normal operation. Tampering with the internal settings makes the warranty null and void. Moreover, could seriously damage the equipment, compromising the guaranteed performance.

Several modules are highly specialized and difficult to repair even by skilled technicians and must therefore be replaced with new modules and, if possible, sent to the manufacturer in order to verify the possibility of a repair.

Any inspection of the described modules must be carried out with the cover removed and, in many cases, with the equipment connected to the power line. Although some live parts are insulated and difficult to reach, this involves the risk of accidental contact with the power line voltage. In order to avoid this, use only insulated tools and never touch the main power supply switch or the power sockets when the equipment is connected to the power line.

Do not operate the equipment without the covers properly screwed on. If the top cover is removed, malfunctioning of the equipment may occur, as well as of any other electronic measuring instrument, owing to the strong R.F. fields involved.

The Archimede High Power models are mainly composed of the following elements:

- Power supply section
- Analog & controls board
- Telemetry board (optional)
- Fans control board
- R.F. amplifier section
- LCD display board
- Digital encoder

If not otherwise specified, the following descriptions are valid for all Archimede High Power models.

6.1 Power supply section

According to the model and/or to the installed options, this section can be equipped with two or three power supply units (⇨Par. 5.3, parts # [25] and [26]). The following table resumes the number of the units per each version:

Model	Number of power supply units
Archimede 3000 standard version (single-phase 230V_{AC} power supply)	**2**
Archimede 3000 with the three-phase with neutral wire 400V_{AC} power supply option (see note at the bottom of this table)	**3**
Archimede 4000 and **Archimede 5000** (standard versions)	**3**

The third power supply unit, if mounted on Archimede 3000, is installed in the central position (⇨ 5.3, parts # [26])

For all models, the power supply units are AC/DC converters (3kW, 48V_{DC} rating) with PFC (power factor correction) with output voltage adjustable from 0 to 30V_{DC}. This supply voltage is adjusted according to a 0-12V command signal sent by the analog & controls board via a flat cable. The units produce two supply voltages: a 30-48V_{DC} to supply the R.F. amplifier section, and a 15V_{DC} to supply the service boards.

6.1.a Power supply unit connections and indications

[41] **Mains voltage input**.
[42] **Power Supply unit status LEDs**.

6.2 Analog & controls board

This board (⇨Par. 5.3, part # [24]) manages all the equipment protections (Direct, Reflected and Max output R.F. powers) via the output power loop control and the reflected power loop control. If there is the need to reduce the amplifier gain, to maintain an high efficiency this board regulates the output power gain loop adjusting, first of all, the MOSFET Drain-Source voltage (the voltage can be regulated from 48 down to 30V). If this isn't sufficient, then the BIAS voltage will be also reduced (please see the bottom note). On the board there is a trimmer (**RV1**) for the adjustment of the maximum output power level (see the following paragraph for information on how to locate and adjust this trimmer)

As soon as the equipment is powered, the fans will start turning at the minimum speed. Then, their speed changes according also to the heatsink temperature.

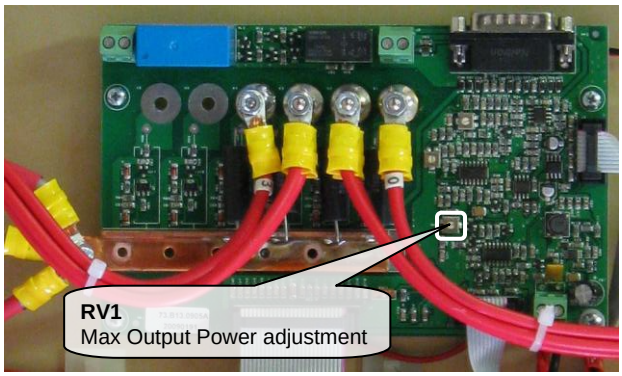
*This board performs all its functions (e.g.: ALC control, output power level management, reflected power max level) in analog mode, without adopting a microprocessor. This solution guaranties **faster processes, and better efficiency and confidence.***

6.2.a Adjustment of the maximum output Power level

With the equipment working, increase the level of the input R.F. driving power until the output level reaches the 120% of the rated power (e.g. 6kW with Archimede 5000), measured with a hi-precision power meter. Now with **RV1** adjust the output power level until the measurement instrument reading is equal to the rated power (e.g. 5kW for Archimede 5000).

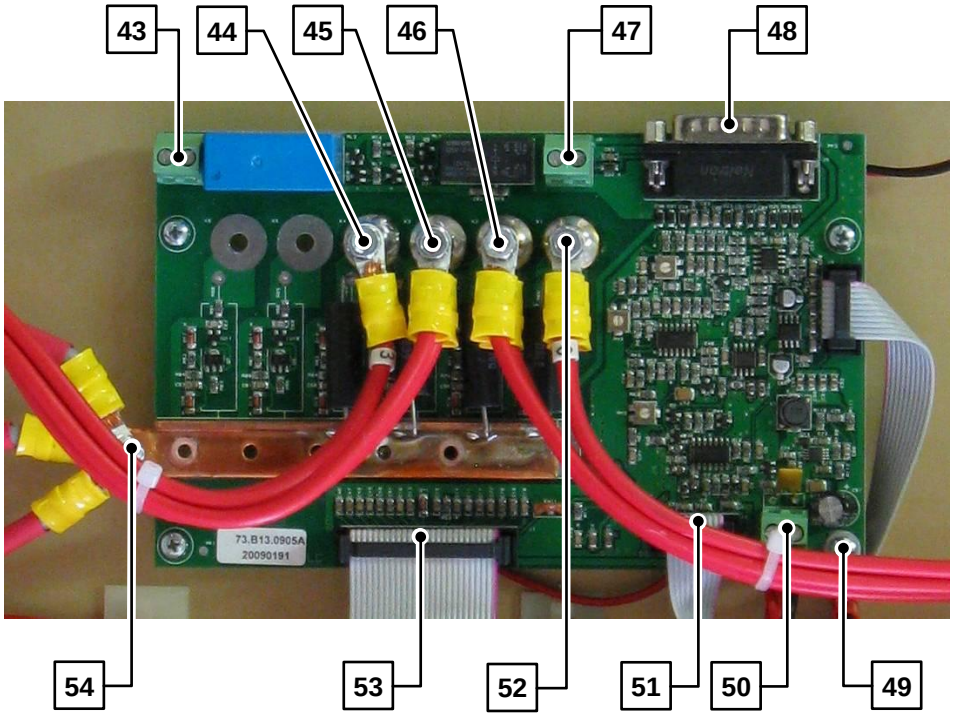
Do not exceed the maximum driving input power given in the following table:

Maximum Driving Input Power levels		
Archimede 3000	Archimede 4000	Archimede 5000
35W	50W	60W



Analog board

6.2.b Analog board connections



[43] **Exciter enabling/disabling command output** – this signal (relay contacts) manages the Exciter power supply. Only with Archimede 3000 and Archimede 4000.

[44] **48V_{DC} power supply for the amplifier module #4** – the (black) power resistor is used for the current measurement. Only with Archimede 4000 and Archimede 5000.

[45] **48V_{DC} power supply for the amplifier module #3** – the (black) power resistor is used for the current measurement.

[46] **48V_{DC} power supply for the amplifier module #2** – the (black) power resistor is used for the current measurement.

[47] **External stand-by input command** – coming (if present) from the rear panel. A short-circuit between the two contacts sets the equipment in stand-by mode.

[48] **Telemetry data bus** – connected with the **REMOTE** port located on the rear panel.

[49] **Ground.**

[50] **15V_{DC} power supply** – from aux power supply.

[51] **Data bus with the Power Supply units**.

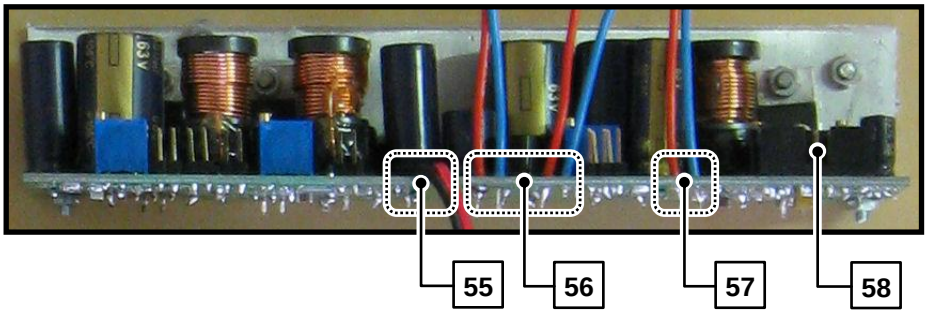
[52] **48V_{DC} power supply for the amplifier module #1** – the (black) power resistor is used for the current measurement.

[53] **Data bus between the analog board and the CPU board.**

[54] **Primary junction for the 48 V_{DC} power supply.**

6.3 Fans control board

This board (Par. 5.3 - part # [23]) features two separated power supply outputs for the fans cooling the heatsink and those cooling the power supply units. The rated power supply is 24V_{DC}, this is why only this service board is powered at 48V_{DC}. This board gets information directly from the R.F. amplifier section via a flat cable.



[55] **48V_{DC} power supply input.**

[56] **Power supply outputs for the cooling fans.**

[57] **Power supply outputs for the fans cooling R.F. amplifier heatsink.**

[58] **Data bus from the R.F. amplifier section** – this flat cable sends data referred to the operation of the **R.F. amplifier section**.

*This bus, common both for the **Fans control board** and the **Analog board**, carries also information relevant to the temperature of the R.F. amplifier heatsink. Such data are then processed, and the result allows changing the fans speed accordingly to the temperature of the R.F. amplifier heatsink.*

*To assure the **maximum reliability**, the equipment has been designed to allow the fans operation even if this board is broken (in this case event the fans will turn at the maximum speed in order to assure the maximum safety).*

6.4 R.F. amplifier section

The R.F. amplifier section is located on the bottom side of the equipment (⇨Par. 5.4). Though some differences due to the different R.F. output powers characteristics of each model, its layout adopts the same structure for all versions. The following paragraphs deals the R.F. signal path, from the Driver amplifier input up to the R.F. section output.

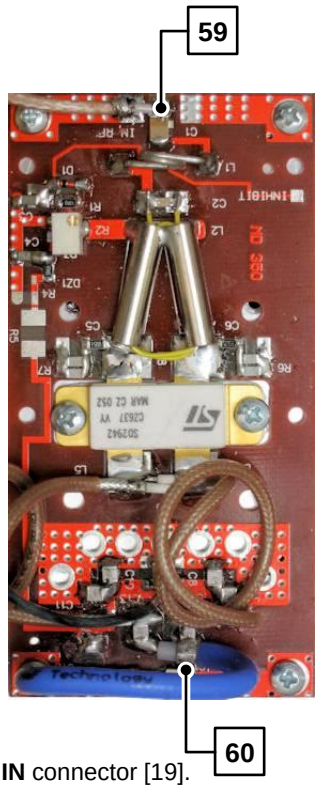
Besides the circuits specifically dedicated to the amplification function, this section includes three special circuits for the:

- Protection of the transistors mounted on the amplifier modules (⇨Par.6.4.c)
- Adjustment of the Input, Direct and Reflected powers readings (⇨Par.6.4.d)
- Extraction of the direct and reflected power levels, and of the low-level R.F. signal (⇨Par.6.4.e)

6.4.a Driver amplifier

The first element of this section is the Driver amplifier (⇨ Par. 5.4 - part # [29]). Its amplification depends on the power supply value. According to the model and to its driving input rated power level, the driver amplifier output power are:

Model	Driving Input rated power level	Driver amplifier R.F. output power @ 24V_{DC} power supply
Archimede 3000	**35W**	**40W**
Archimede 4000	**50W**	**50W**
Archimede 5000	**60W**	**60W**



[59] **R.F. signal input (5W)** – coming from the **RF IN** connector [19].
[60] **R.F. signal output** – connected to the Wilkinson Splitter board.

6.4.b Amplifier circuits

The R.F. signal from the Driver amplifier enters first the Wilkinson splitter (⇨ Par.5.4 - part # [30]) . This circuit splits the R.F. signal into three or four outputs, according to the model:

- **Archimede 3000** features a 3-ways Wilkinson splitter.
- **Archimede 4000** and **Archimede 5000** feature a 4-ways Wilkinson splitter.

Each split signal becomes the input of one of the subsequent amplifier modules. The number and type of these modules change according to the model:

- **Archimede 3000** is equipped with three 1,300W modules (⇨ Par. 5.4 - parts # [31], [32], [33]).
- **Archimede 4000** is equipped with four 1,300W modules (⇨Par. 5.4 - parts # [31], [32], [33], [34]).
- **Archimede 5000** is equipped with four 1,500W two step modules (⇨Par. 5.4 - parts # [31], [32], [33], [34]).

The three (or four) amplified signals are then combined in a single one, by means of a Wilkinson combiner (⇨ Par. 5.4 - part # [35]). The three models mount different combiners:

- **Archimede 3000** is equipped with 3-ways Wilkinson combiner.
- **Archimede 4000** is equipped with 4-ways Wilkinson combiner.
- **Archimede 5000** is equipped with 4-ways Wilkinson two steps combiner.

The output of the combiner is connected to a Low-pass filter (⇨ Par. 5.4 - part # [36]). This circuit, the same for all models, delivers the signal to the antenna (⇨ **RF OUT** flange [17]).

Due to the high R.F. powers managed by the Archimede High Power series, these models feature R.F. circuits implemented using teflon laminated pcb.

The adjustment of the output power is obtained adjusting the amplifier's section gain by means of a proper setting. This solution guarantees a constant high efficiency, even when the user decides to set an output power which is lower than the rated one.

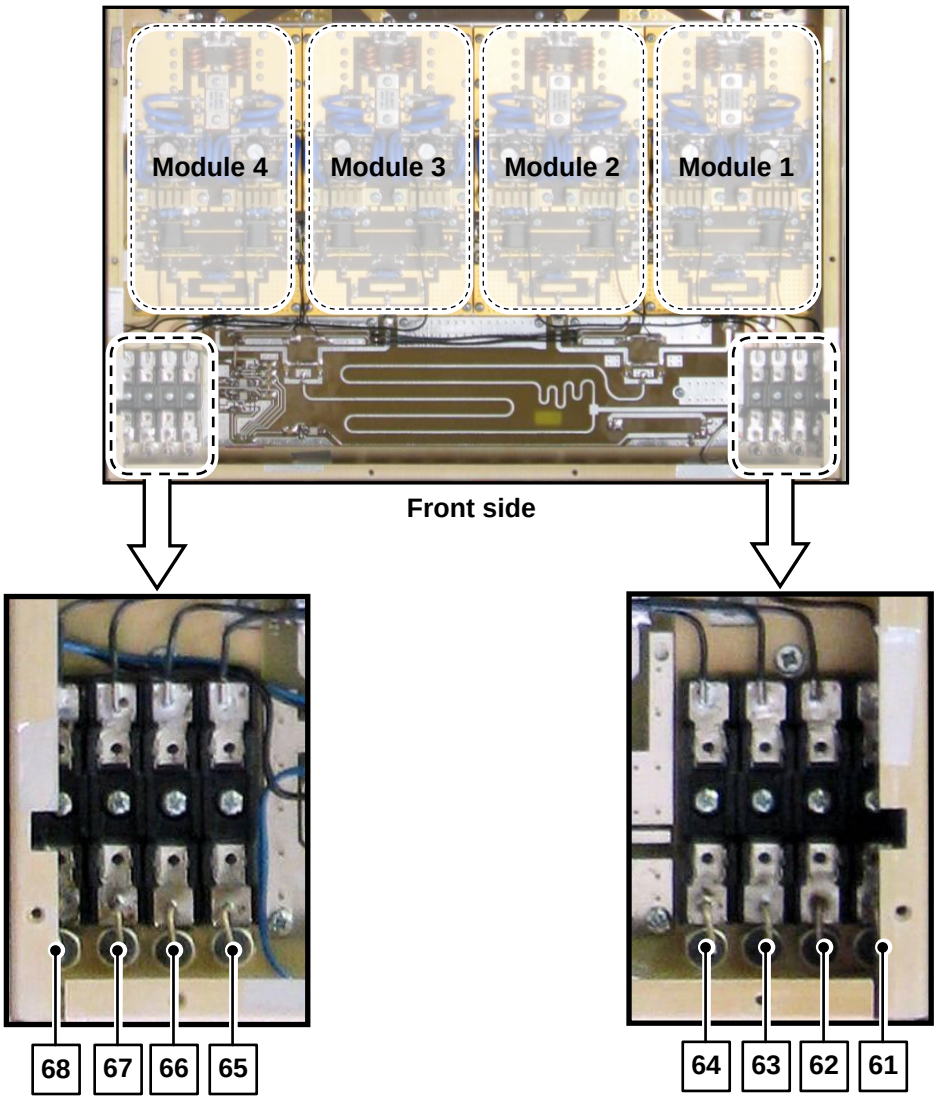
Thanks to the use of over-dimensioned amplifier modules, the Archimede High Power series rated output powers are lower than the max output power they could deliver. This solution allows a better reliability (note: the maximum output power levels are factory limited).

6.4.c Protection fuses for the amplifier modules

The Archimede High Power series mounts fuses (⇨ Par. 5.4 - parts # [39] and [40]) to protect the two transistors of each amplifier module. In total, there are:

- **Archimede 3000**: 6 fuses.
- **Archimede 4000** and **Archimede 5000**: 8 fuses.

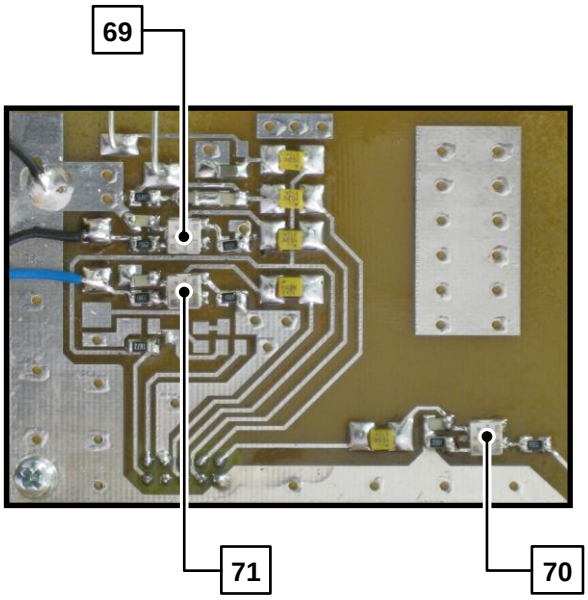
The fuses are: 6.3 x 32 30A slow blow type. Here are the fuses locations and their relevant transistors:



[61] **Protection of module 1 / transistor1** (valid for all models).
[62] **Protection of module 1 / transistor2** (valid for all models).
[63] **Protection of module 2 / transistor1** (valid for all models).
[64] **Protection of module 2 / transistor2** (valid for all models).
[65] **Protection of module 3 / transistor1** (valid for all models).
[66] **Protection of module 3 / transistor2** (valid for all models).
[67] **Protection of module 4 / transistor1** (only valid for **Archimede 4000** and **Archimede 5000**).
[68] **Protection of module 4 / transistor2** (only valid for **Archimede 4000** and **Archimede 5000**).

6.4.d Input/Direct/Reflected power levels readings adjustment circuit

This circuit (⇨ Par. 5.4 - part # [38]) mounts trimmers used to adjust the input, direct and reflected power readings shown on the LCD display:



[69] **Reflected Power reading adjustment** – use this trimmer to adjust the reflected power level reading.
[70] **Input Power reading adjustment** – use this trimmer to adjust the input power level reading.
[71] **Direct Power reading adjustment** – use this trimmer to adjust the direct power level reading.

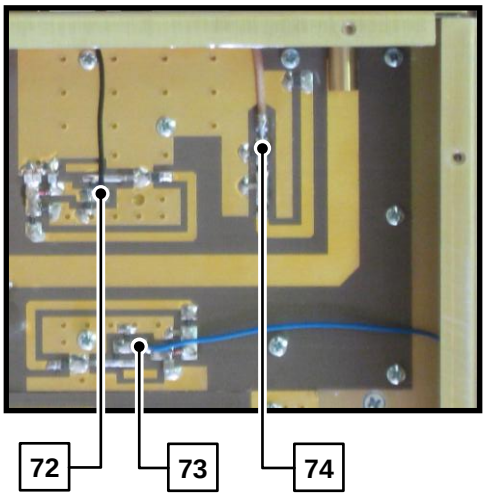
INPUT POWER READING ADJUSTMENT: check with an hi-precision R.F. power-meter the level of the driving signal coming from the Exciter, then adjust the trimmer [70] until the display shows the same power reading.

DIRECT POWER READING ADJUSTMENT: with the equipment in normal operation (ON mode), and the display showing the working page (e.g.⇨10.2), check with an hi-precision R.F. power-meter the rated output power, then adjust the trimmer [71] until the display shows the same direct power reading.

REFLECTED POWER READING ADJUSTMENT: check the reflected power level with an hi-precision directional power meter, then adjust the reflected power level reading accordingly, using the trimmer [69].

6.4.e Extraction of direct/reflected power levels and low-level R.F. signal

This circuit (⇨Par.5.4 - part # [37]), mounts directional couplers, used to extract the direct and reflected power level signals and a low R.F. level from the output power signal:



[72] **Reflected power signal** – for measurements directly carried out by the analog & controls board, shown on the LCD display.
[73] **Direct power signal** – for measurements directly carried out by the analog & control board, shown on the LCD display.
[74] **Low level R.F. output signal** – connected to the **RF MONITOR** connector [2] located on the front panel.

6.5 LCD display board

This board integrates the LCD display [7], and three LEDs (for further details ⇨5.1.a). By communicating directly with the CPU, the LCD display keeps the user informed with various information and messages (e.g. menus, alarms etc.)

6.6 Digital encoder (multifunction knob)

This board is located in the back of the front panel. It holds the rotary digital encoder, directly connected to the multifunction knob [8]. The board communicates directly with the CPU, which detects the user commands: clockwise rotations, counterclockwise ones, as well as pushbutton operations.

7 INSTALLATION

Warning: to ensure safe functioning of the equipment, it's absolutely mandatory to comply with the instructions of the present chapter.

7.1 Checking the supplied parts

Before using your amplifier, make sure that the following parts are included in the packing:

- The amplifier
- The user's manual (this manual)
- RG58 N-N cable, 1 meter length, to connect the amplifier input [19] to the exciter output.
- Power supply patch cable to be used to connect the power supply input of the exciter to the **INTERLOCK AUX** connector [20] of the Archimede equipment. Only with Archimede 3000 and Archimede 4000.

In case some parts are damaged or missing, promptly contact your supplier.

7.2 General safety rules

Warning: in order to prevent serious damages to objects and people, the following rules must be strictly followed.

- Although in most cases no special instruments are required, the equipment must be installed by skilled personnel only. To make best use of the equipment and prevent damage to the unit, compliance with the instructions of the present manual is mandatory. Should doubts or technical problems arise during the installation procedure, you are strongly recommended to contact Italab or a local appointed agent/dealer.
- Should you encounter any technical problems or be in any doubts about the installation procedure, Italab will be happy to provide its qualified technical support service. We strongly recommend that no interventions must be carried out by personnel not authorized by Italab.
- As a rule, the user should not have access to the inner parts of the equipment. Tampering with the factory settings makes our warranty null and void and might also affect the equipment performance, causing expensive damages.
- No adjustments or internal settings are required for normal operations. The equipment shall be properly earthed and be operated with all the covers closed to prevent electrical hazards and fully comply with EC, EMI and all local safety requirements.
- Never touch the inner parts of the equipment without first disconnecting it from the AC power line. Dangerous AC, DC and radio-frequency voltages are available inside and become accessible when the covers are removed.

7.3 Placing the equipment

7.3.a Choosing the proper room and location

- Install the equipment in a dry, sheltered but well-ventilated room away from dust, moisture, insects, rodents and vermin (e.g. mice).
- Room size shall be such that the equipment can be placed in an upright position and that the technical personnel can easily carry out routine or extraordinary maintenance.
- Place the equipment as close as possible to the antenna in order to prevent excessive power loss in the cables. If this is not feasible, use antenna low-loss cables of suitable cross-section.
- Vents in the walls and any other openings shall be fitted with metal grids to keep rodents and insects out and with a dust filter. Make absolutely sure that no water could penetrate through the vents or the air exhaust duct or the antenna-cable grommet, and that the floor cannot be flooded during heavy rainfall.

7.3.b Environmental Conditions

- In order to achieve the best possible performance in terms of power, life span, etc., the ideal room temperature should range between -10°C and + 45°C. It is advisable to install in the room a min-max thermometer to display any variation.
- The room must be ventilated to ensure that the temperature never exceeds 45°C. Such conditions CANNOT be generally met when the exhaust cooling air is not pushed outside and is instead fed back into the room. This is even truer if more than one unit is installed in the same location. An efficient ventilation system is thus required in the room. Air exchange in the room shall have a minimum flow-rate of 500 meters per hour or more.
- As a rule, if the equipment is fitted in a rack, the rear cover cannot be secured. If it is required that the equipment be totally enclosed, a forced ventilation and air extraction system must be provided. In order to assist the air flow an exhaust ventilation system with a flange must be connected to a hot air exhaust duct communicating with the exterior. In this case, bear in mind

that the equipment internal fans are low-pressure units and therefore an air extractor on the air exhaust duct in definitely needed.

- Air conditioning at 20 – 25 °C would obviously be the best solution. Thermal insulation and efficient ventilation with a thermostat-controlled blower are generally the best solution.
- Even moisture and/or dust, when excessively present in the air or in the room, may cause condensation build-up in the equipment. If the system is periodically switched on and off, this can trigger destructive electric arcs and short circuits and thus cause damage which is not covered by warranty.

7.3.c Electrical conditions

- According to model and/or to the installed options, this equipment can be powered by a single-phase or a three-phase line. The power grid capacity should be configured and dimensioned to suitably meet (with a sufficient safety margin) the consumption needs of the device.
- Fluctuations of the power line and electric discharges due to weather or nearby industrial machinery may cause significant trouble, especially in mountain areas and in locations close to industrial areas.
- In many cases it is advisable, if not mandatory, to install a protector, an insulating transformer or possibly an electromechanical AC power voltage regulator.

Since the total cost of the plant, inclusive of broadcasting equipment, antenna system and installation is rather high, a certain percentage of the budget should be evaluated for buying and installing suitable protection and conditioning facilities as described above. It has to be considered that such additional costs will be absorbed very quickly since the equipment will work under ideal conditions, its useful life-span will increase and, above all, the incidence of accidental breakdown due to environment or power line trouble will be reduced.

7.4 Connecting the equipment

7.4.a Connecting the antenna

- It's very important to check that antenna, cables and connectors are suited for the rated output powers featured by the adopted Archimede High Power model.
- The antenna divider is also expected to have adequate power.
- Choose cables suitable for the equipment rated output power and the output signal connector type.
- The antenna will be earthed through a copper braid of suitable cross section to prevent lightning or static electricity from reaching the equipment through the antenna cable.

7.4.b Connecting the AC power line

Wire the power supply cable of the equipment to a suitable power supply source.

The power supply for the Archimede 3000 standard version is a single-phase $230V_{AC.}$ As an option, this model can be supplied for a three-phase with neutral wire $400V_{AC}$ power supply.

Archimede 4000 and Archimede 5000 can be connected to a single-phase $230V_{AC}$, or to a three-phase $220V_{AC}$, or to a three-phase with neutral wire $400V_{AC}$ power line.

TO EARTH ARCHIMEDE 4000 OR ARCHIMEDE 5000 USE THE GROUND WIRE OF THE POWER SUPPLY CABLE.

REFER TO THE FOLLOWING PARAGRAPH 7.4.c FOR THE CORRECT AC POWER LINE CONNECTION OF ARCHIMEDE 4000 AND ARCHIMEDE 5000!

Before connecting the power supply cable, make sure that the equipment will be compatible with the power supply source you are planning to use.

The power supplied by the AC power socket must comply with what stated in the paragraph 7.3.c.

Operation near the lower input voltage on high impedance lines must be avoided: if the power line voltage drops below a certain limit at full load, the low line sense circuitry may trigger an oscillating turn-on/turn-off cycle, which is very dangerous. In this case, it is advisable to use an external line stabilizer.

In order to ensure proper operation and comply with the safety regulations, an efficient connection to earth is required. Never connect the earth to the power line neutral lead.

Use only the power supply cable supplied with the amplifier. In case of a cable extension, use cables with suitable gauge.

Never switch on the equipment without an antenna connection.

7.4.c Connection of the Archimede 4000 or Archimede 5000 power supply cable

Carefully follow these information when connecting the power supply of Archimede 4000 or Archimede 5000 standard version:

FOR THREE-PHASE+N 400 V_{AC} POWER SUPPLY CONNECTION	
Connect wires number:	**to the:**
2, 4, 6	**Neutral**
1	**400V_{AC} - Phase 1**
3	**400V_{AC} - Phase 2**
5	**400V_{AC} - Phase 3**

FOR SINGLE-PHASE 230 V_{AC} POWER SUPPLY CONNECTION	
Connect wires number:	**to the:**
2 , 4, 6	**Neutral**
1, 3, 5	**230V_{AC} - Phase**

The information given in this paragraph are also valid for <u>Archimede 3000 supplied with the option for the connection to a three-phase power supply</u> .

To avoid personal injury and damages to the equipment, make sure of the AC power line connections before switching on the equipment.

7.4.d Connecting to the exciter

Proceed in the following way:

1) Connect the exciter to an independent AC power line.
2) Connect the exciter's R.F. output to a suitable dummy load.
3) Switch the exciter on.
4) Set the exciter R.F. output power to zero.
5) Check that the correct FM frequency of the exciter is set.
6) Switch the exciter off and connect the **RF IN** connector of the amplifier [19] to the exciter's output through a shielded N-N cable.
7) <u>Only when using Archimede 3000 or Archimede 4000</u>: disconnect the exciter from the independent AC power line; then connect the power supply input of the exciter to the amplifier **INTERLOCK AUX** connector [20] using the supplied patch cable.

Warning: In order to avoid any damage to the equipment, make sure that the driving power never exceeds the following values.

Maximum Driving Input Power levels		
Archimede 3000	**Archimede 4000**	**Archimede 5000**
35W	**50W**	**60W**

8 BASIC OPERATIONS

If not otherwise specified, the following descriptions are valid for all Archimede High Power models.

8.1 Turning on/turning off

8.1.a First switching on (during installation)

The amplifier stores in its memory the operation mode in which it was working before the power supply was turned off or a power line interruption (blackout) took place. Therefore, depending on whether it had been previously turned on or not, the switch-on operations may vary as follows.

The amplifier output power must be adjusted only and exclusively through the menu of the amplifier itself, and NOT through the driving power. For this reason, follow the instructions given below.

1) Make sure that all installation conditions as described in Chapter 7 are met, and that all connections described in 7.4.a, 7.4.b, 7.4.c and 7.4.d have been properly made. You can connect a proper dummy load to the amplifier's R.F. output instead of the antenna.
2) Make sure that the exciter output power is zero.
3) Turn on the **Power ON/OFF** switch [18] on the rear side.
4) At this stage, two conditions may take place:
   - **The amplifier turns on,** so do the fans and the display (see note below). This usually – and automatically - happens after an AC power line black out. If so, you can skip directly to point 6)
   - **The amplifier DOESN'T turn on,** the display will briefly show some screenshots before entering in **`Stand-by`** mode - In such case go to the next step.
5) Keep the **ON/STAND-BY** button [6] pressed for a couple of seconds: the amplifier and the fans will turn on. The display briefly shows some screenshots. At the end the green **ON** LED [9] will steadily glow and the working page (the one normally shown in the normal operation ⇨10.2) will steadily stay on the display:

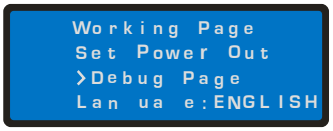
6) Switch on the exciter.
7) Gradually increase the driving power until it reaches the rated Input level. Under these conditions, the amplifier will not yet deliver its output power.

Warning: DO NOT exceed the rated Input level of the driving power (⇨7.4.d), otherwise the equipment could be damaged.

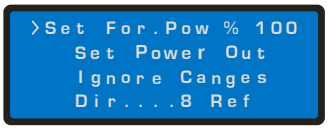
As soon as the equipment is powered, the fans will start turning at the minimum speed. Then, the control board will change their speed according to the heatsink temperature.

8.1.b Adjusting the output power

8) Should you wish to adjust the output power, from the over stated working page press the knob (as it was a normal pushbutton) in order to access the main menu, then turn the knob counterclockwise in order to move the cursor **>** downward to the left of **`Set Power Output`** as per the following picture (for the use of the menus ⇨Par.10):

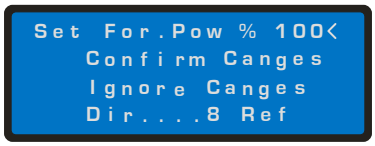


9) Press the multifunction knob and the following menus will be shown:



10) Ensure that the **>** cursor is placed on the left of the **`SET For.Pow`** menu (if not, turn the multifunction knob until you reach it).

11) Press the multifunction knob to select this menu and move the **>** cursor on the right of the power value (in this example 100 – see the following note):



12) Gradually turn the multifunction knob until you set the needed output power (clockwise to increase the value, counterclockwise to reduce it). The forth line (**`Dir ...Ref`**…) will show the measured direct and reflected power values.

13) Press the multifunction knob to enter the selected power. The cursor will be moved on the left side of the option (in the following image the power was set to 91 %):

14) Turn the knob counterclockwise in order to move the **>** cursor to **`Confirm Changes`**, then press the knob to save the settings and come back to the main menu.

IMPORTANT: do not exceed the rated output powers (e.g.: 5000W with Archimede 5000, or 100% in Stand-by mode).

When setting output power with the equipment in normal operation (ON status), if the reflected power exceeds the set value for the Archimede model, the system will release an alarm because of the excessive V.S.W.R. (Voltage Standing Wave Ratio) (⇨Par.13.1) . In this case check the antenna system to reduce as much as possible the reflected power.

Warning: operation without antenna, or with a faulty antenna, may cause degradation and possible destruction of the R.F. power stage. Such failures are not covered by our standard warranty.

Step 11 - the previous images refer to the first switch on with the equipment in stand-by mode. In this condition power value is in percentage and referred to a logarithmic scale – meaning, for example, that the setting 50 will be about ¾ of the rated power level (e.g. 3750W with Archimede 5000). When the equipment is normally working, the SET For.Pow value will be given in W. The forth row (Dir ....Ref) will also show the direct and reflected power levels in W.

8.1.c Setting the display language

15) Should you wish to change the language used on LCD display, from the main menu turn the knob counterclockwise in order to move the cursor **>** downward to the left of **`Language`** as per the following picture:

16) With the **>** cursor still on the left of **`Language`** (showing also the current used language), press the knob. Every time the knob is pressed an alternative language is selected.

Note that you are still inside the main menu, so no operations are necessary to come back to it.

8.1.d Setting date and time

Setting date and time is important to manage some time-related functions (e.g. the Power saver function ⇨ 11.1.d). Do that in the following way:

17) To change the date and time, from the main menu turn the knob counterclockwise in order to move the cursor **>** downward and access the second page of the main menu as per the following picture. Keep on rotating the knob till moving the cursor **>** to the left of **`Set Clock`**:

18) Press the knob. The **Set Clock** menu will be shown (split in two pages):

19) Turn the knob counterclockwise in order to move the cursor **>** downward to the left of **Year**.

20) Press the knob. The cursor **>** will move to the right of **Year** and the year will become editable.

21) Turn the knob to set the year (e.g. 2039):

22) Press the knob to enter the setting (the cursor **>** will come back to the left of **Year**).

23) If necessary, repeat the steps 19) to 22) with **Month**, **Day**, **Hour**, **Minute** and **Second**.

24) Turn the knob counterclockwise in order to move the cursor **>** downward to the left of **Confirm Changes** (the last option).

25) Press the knob to confirm the settings and come back to the main menu.

26) Turn the knob clockwise in order to move the cursor **>** upward to the left of **Working Page** (the first option),

27) Press the knob. The display will go back to the working page.

The installation of the amplifier is now completed. A spectrum analysis would be advisable to make sure that no spurious emissions, due to internal or external causes (i.e. intermodulation on the final stage), are generated.

Italab wish you success in your work and remind you that we are always available for further information or to solve any specific problem.

8.1.e Turning off

1) Keep the **ON/STANDBY** button [6] pressed for a couple of seconds setting the equipment in stand-by mode.
2) Turn off the **Power ON/OFF** switch [18] on the rear panel.

9 USE OF THE MENUS

9.1 Use of the multifunction knob

The multifunction knob is used to surf the menu with its submenus and set/check their parameters. It can be used in 3 ways:

- **By turning it clockwise (fig. 1)** - while a menu is being displayed, this moves the **>** cursor upwards.

figure 1

figure 2

- **By turning it counterclockwise (fig. 2)** - while a menu is being displayed, this moves the **>** cursor downwards.
- **By pressing it as it was a normal pushbutton (fig. 3**) - while a menu is being displayed this activate the option currently pointed by the **>** cursor. While a password-related menu is displayed, this enters the value set in the digit pointed by the **Λ** cursor.

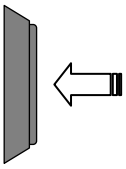


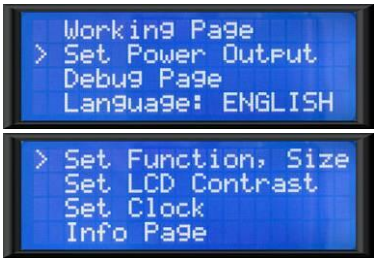
figure 3

9.2 Navigating the menu

In the menu navigation, generally speaking, the use of the knob is the following:

1) From the working page (⇨10.2):

2) Press the knob. The display will show the main menu (which is split in two pages):



3) Turn the knob until the **>** cursor on the left points one of the over stated menus.
4) Press the knob to select the needed menu.
5) If necessary (according to the selected menu), repeat one or two times these last two steps in order to access to further submenus (e.g. in the **`Debug Page`**).
6) According to the needed option is accessed, you can:
   - See the shown parameter(s) as explained in each dedicated paragraph, then go to step 8).
   - Change the selected parameter(s). In this case go to step 7).
7) As explained in each dedicated paragraph, use the knob to set the needed parameter, then be sure to confirm it (usually by means of the menu **`Confirm Changes`** - ⇨next paragraph).
8) Exit the menu with the appropriate commands (see each dedicated paragraph) and come back to the working page as explained in each dedicated paragraph.

The described commands are to be considered as standard actions (bear in mind that in some menus they are slightly different). For details about each single menu and how operate on it ⇨Chapt. 10 - Menu description.

*After 4 minutes of inactivity (no actions on the knob), the system automatically quits the currently shown menu, going back to the working page. After an operation within the menus, it's however advisable to manually go back to the working page by selecting in the main menu the first option – **Working Page** – and pressing the knob.*

9.3 Confirming/quitting the settings

Some menus allow setting the parameters or way of operation of the amplifier (e.g. **Set Power Output**). Apart some exceptions (e.g. **Language** which is in the main menu), the following operation are needed to confirm the entered settings:

1) Be sure to have entered the needed setting (e.g. the output power as shown below):

2) Turn the knob counterclockwise in order to move the **>** cursor to **Confirm Changes**.

3) Press the knob to save the settings and come back to the main menu.

If you entered a wrong setting, you can quit the menu without saving it. To do so, just select **Ignore Changes** *as step 2.*

Some confirming/quitting operations might slightly change according to the menu. Please refer to each dedicated paragraph.

In order to make this manual simpler, Confirm Changes and Ignore Changes commands won't be stated from the available options from now. They'll be stated just in the description of the steps to follow.

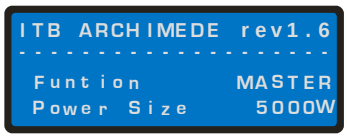
10 MENU DESCRIPTION

If not otherwise specified, the following descriptions are valid for all Archimede High Power models.

Only as example, some images show displays referable to Archimede 5000 model (e.g. see the following Par.10.1).

10.1 Startup page

When the equipment is turned on by means of the **Power ON/OFF** switch [18] located on the rear panel, the **STAND-BY** yellow LED [10] will glow and the equipment temporarily displays the startup page containing the following information:



- **ITALAB ARCHIMEDE**: model of the equipment
- **Rev.1.6**: revision number
- **Function**: equipment working mode - **MASTER** (standalone single equipment mode) or **SLAVE** (controlled by an external management unit within a broadcasting system)
- **Power Size**: rated output power (⇨11.1.b)

After some seconds, the display will switch to the working page (⇨following paragraph).

10.2 Working Page

The working page is the one displayed in normal operation and shows the most important information related to the amplifier. In fact, inside the menu, after 4 minutes of inactivity (no actions on the knob) a timer automatically quits the menu restoring the working page. These are the information displayed in it:

- **ITB ARCHIMEDE rev.1.6**: model of the equipment and software revision
- **Forward Power**: forward power level
- **Reflected Power**: reflected power level
- **10 Sep 2010 12.04.42**: system date and time (see bottom note)

To access the main menu from the working page, press the knob.

The display backlight has a three minutes timeout. To switch on the backlight turn the multifunction knob.

The system time is shown in 24-hour format.

10.3 Main menu

As explained, the main menu is accessed by pressing the knob from the working page.

If necessary, to come back to the working page turn the knob clockwise to move the cursor **>** upward to the left of **Working Page** (the first option), then press the knob to come back to the working page.

The main menu is split in two pages:

- **`Working Page`**: leads back to the working page as over explained
- **`Set Power Output`**: sets the output power (⇨10.4)
- **`Debug Page`**: reads some measurements, checks the knob/digital encoder operation and current alarms (⇨10.5)
- **`Language`**: sets the display language (⇨10.6)
- **`Set Function, Size`** allows to set the master or slave mode, to automatically reduce the power in certain times, to show the time with the equipment in normal operation, alarm and stand-by mode, etc (⇨10.710.7)
- **`Set LCD Contrast`**: sets the LCD contrast (⇨10.8)
- **`Set Clock`**: sets date and time of the system clock (⇨10.9)
- **`Info Page`**: it shows info about Italab (email, technical support telephone number) (⇨10.10).

10.4 `Set Power Output` menu

Refer to par. 8.1.b in which this menu is already explained.

After you entered the needed power level, don't forget to confirm it: select **`Confirm Changes`** and press the knob (or, to quit the menu without changing the previous setting, select **`Ignore Changes`** and press the knob). For information about these commands ⇨9.3.

10.5 `Debug Page` menu

This menu shows some analog measurements (forward and reflected output power, driving input power, bias voltage, temperature of the heatsink, etc.), checks the operation of the **ON/STAND-BY** button and digital encoder of the multifunction knob. It also shows the presence of a stand-by command coming from the **REMOTE** connector [14] and any eventual current alarms.

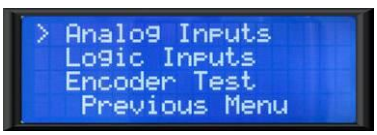
1) Turn the knob counterclockwise in order to move the **>** cursor to the left of **`Debug Page`**:

2) Press the knob. The debug page will be shown:

- **`Analog Inputs`**: shows the analog measurements (⇨10.5.a)
- **`Logic Inputs`**: checks the operation of the **ON/STAND-BY** button, if there is an external stand-by command and shows if one or more alarms are currently released (⇨10.5.b)
- **`Encoder Test`**: checks the operation of the digital encoder of the knob (⇨10.5.c)
- **`Previous Menu:`** leads back to the main menu

10.5.a `Analog Inputs` menu

1) From the debug page (⇨the previous paragraph), ensure that the **>** cursor is on the left of **`Analog Inputs`** menu (otherwise turn the knob counterclockwise in order to move it to this place), then press the multifunction knob.



2) The read-only **Analog Inputs** menu will show. It's split in three pages and lists the results of internally carried out measurements:

- **Forward Power**: forward output power level
- **Input Power**: driving input power level
- **Reflected P.**: reflected power level
- **BIAS Volt:** bias voltage.

In stand-by mode the **BIAS Volt** *value is* **NEGAT** *(negative), whereas during the normal operation it will be a voltage value*

- **Heatsink T. C**: temperature of the amplifier section heatsink (in °C)
- **Ambient T. C**: environmental temperature (in °C).
- **Main Voltage**: power supply voltage of the MOS FETs
- **Module Curr. 1**: current of the amplifier module # 1
- **Module Curr. 2**: current of the amplifier module # 2
- **Module Curr. 3**: current of the amplifier module # 3
- **Module Curr. 4**: current of the amplifier module # 4 (only with Archimede 4000 and Archimede 5000).

To quit and go back to the **Debug Page**, press the knob.

10.5.b Logic Inputs menu

This menu allows to check the proper operation of the **ON/STAND-BY** button by checking its dedicated contacts of the control board. Moreover, it shows the presence of an external stand-by command coming from the **REMOTE** connector [14]. Finally, it shows if one or more alarms are currently released (⇨ 13.1).

1) From the **Debug Page** (⇨10.5), select **Logic Inputs**.

2) Press the knob. The **Logic Inputs** page will be shown (see bottom note):

- **Start Button**: proper operation of the **ON/STAND-BY** button. It is tested on the related contacts in the CPU board (in order to also test the wirings). When pressed, **OFF** changes into **ON**
- **standby**: in case of an active stand-by command, you will see **ON**
- (alarm name) - if one or more alarms are currently released it/they will be shown from this line (see bottom note)

3) To quit and go back to the **Debug Page**, press the knob.

If one or more alarms will be released, they will be displayed from the 3rd line, so the **Logic Inputs** *page could be eventually split in two ones in order to make sufficient room to accommodate the alarm(s). To scroll the alarms, simply turn the knob counterclockwise.*

10.5.c `Encoder Test` menu

This menu allows to check the correct operation of the digital encoder connected to the knob.

1) From the **`Debug Page`** (⇨10.5), select **`Encoder Test`**:

2) Press the knob. The **`Encoder Test`** menu will be shown:

3) Turn the knob and check if the **`A`** and **`B`** values are changing. As an example, the following image was taken after having turned a bit the knob starting from the previous image:

4) To quit and go back to the **`Debug Page`**, press the knob.

10.6 `Language` menu

Refer to par. 8.1.c in which this menu is already explained.

After setting the language, you are still inside the main menu, so no operation are necessary to come back to it. Instead, you might decide to come back to the working page by turning the knob clockwise in order to move the cursor **>** upward to the left of **`Working Page`** (the first option), then press the knob to come back to the working page.

10.7 `Set Function, Size` menu

It's a special password-protected technical menu. For detailed information, see the dedicated Chapter 11.

10.8 `Set LCD Contrast` menu

1) From the main menu (⇨10.3), select the **`LCD Contrast`** option:

2) Press the knob. The **`LCD Contrast`** menu will show the current level of the LCD contrast (in this example 140):

3) Ensure that the cursor is placed to the left of **`LCD Contrast`** as in the previous image (otherwise turn the knob to move it), then press the knob. The cursor will move on the right of **`LCD Contrast`**:

4) Turn the knob to change the LCD contrast and you will directly see the result of the adjustments. Here are some images showing how the contrast changes turning the knob:

5) When the needed contrast level is set, press the knob. The cursor will move on the left:

6) To confirm the entered settings, select **`Confirm Changes`** and press the knob (or, to quit the menu without changing the previous setting, select **`Ignore Changes`** and press the knob).

For information about **`Confirm Changes`** *and* **`Ignore Changes`** *commands* ⇨*9.3.*

10.9 `Set Clock` menu

Refer to par. 8.1.d in which this menu is already explained.

After you entered the clock settings, don't forget to confirm them: select **`Confirm Changes`** and press the knob (or, to quit the menu without changing the previous setting, select **`Ignore Changes`** and press the knob). For information about these commands ⇨9.3.

10.10 `Info Page` menu

This menu shows the contact information of Italab (email, technical support telephone number) in order to get in touch with it in case of support is needed.

1) From the main menu (⇨10.3), select the **`Info Page`** option:

2) Press the knob. The **`Info Page`** will show the following information:

- **`ITALAB Communications. systems`**: brand name
- **`email: info@Italab.it`**: email address of Italab
- **`0039 02 90389417`**: Italab Technical Support telephone number.

3) To quit the menu and come back to the main menu, press the knob.

11 SET FUNCTION, SIZE MENU

This multilevel technical menu allows to set the equipment as MASTER or SLAVE, set its power size (according to the model), check the time in which it worked in normal operation or other conditions and automatically reduce its output power in certain times.

This menu is password protected. The factory default password is **000000** and can be changed (⇨11.1.e).

1) From the main menu, turn the knob counterclockwise in order to move the cursor down to **Set Function, Size**:

2) Press the knob. You are prompted to insert the password (six digits in total). The cursor **Λ** points its first digit.

3) Turn the knob to set the correct number (in the example **0**), then press the knob to enter it and move the cursor **Λ** underneath the second digit:

4) Repeat the last step until all the six digits have been set. When the knob is pressed the sixth time, the whole password will be entered.
5) If the password is correct, the following page will be shown (if not, the display will go back to main menu):

- **ENTER to access Program page**: to access the program page press the knob (⇨11.1).
- **UP-DOWN to set new password**: to change the password turn the knob (⇨11.1.e).

11.1 Program page menu

This technical menu allows to select the equipment as MASTER or SLAVE (⇨10.1), set the power size according to the rated value of each model, check the time in which the equipment worked in normal operation, was in alarm or in stand-by mode and automatically reduce the output power in certain times (e.g. in the night).

6) After having entered the **Set Function, Size** menu with the correct password as over stated, the display will show:

7) Press the knob. The program page will be shown. It's split in two pages:

- **Function**: operation as **MASTER** or **SLAVE** (⇨11.1.a)

- **`Power Size`**: power size according to the rated value of each model (⇨11.1.b)
- **`Show timers`**: time in normal operation, alarm or stand-by mode (⇨11.1.c)
- **`Set power saver`**: power saver time settings (⇨11.1.d)

For information about **`Confirm Changes`** *and* **`Ignore Changes`** *commands ⇨9.3.*

11.1.a `Function` menu

This menu allows to set the equipment as MASTER (standalone single equipment) or SLAVE (working within a broadcasting system). If the equipment is set as SLAVE, it will stay in stand-by mode until a proper signal will come from the **REMOTE** connector [14].

To set the equipment in MASTER or SLAVE mode.

1) In the program page, ensure that the cursor **>** is on the left of **`Function`** (if not, turn the knob in order to move the cursor **>** this way).

2) Press the knob repeatedly till reading MASTER or SLAVE according to your needs.
3) Should you have other settings to do in the **`Program Page`**, directly skip to one of the following paragraphs. If not, go on with the next step.
4) To confirm the entered setting, select **`Confirm Changes`** and press the knob (or, to quit the menu without changing the previous setting, select **`Ignore Changes`** and press the knob).

Step 3 - note that you are still inside the program page, so no operations are necessary to come back to it, but you haven't still stored the entered setting, so performing step 4 is mandatory.

If the equipment is used within a broadcasting system (set to **`SLAVE`***) and the other amplifier develops a fault, the working equipment can be used alone by setting it as* **`MASTER`***.*

11.1.b `Power size` menu

This menu allows setting the power size according to the rated value of each model:

1) In the program page, ensure that the cursor **>** is on the left of **`Power Size`** (if not, turn the knob in order to move the cursor **>** this way).

2) Press the knob repeatedly till reading the proper power size (e.g.:5000W for Archimede 5000).
3) Should you have other settings to do in the program page, directly skip to one of the following paragraphs. If not, go on with the next step (see note at the bottom).
4) To confirm the entered setting, select **`Confirm Changes`** and press the knob (or, to quit the menu without changing the previous setting, select **`Ignore Changes`** and press the knob).

Step 3 - note that you are still inside the program page, so no operations are necessary to come back to it, but you haven't still stored the entered setting.

Thanks to the **`Power size`** *menu, it is possible to use the same control board as an "universal" spare part for all the Archimede models.*

11.1.c `Show Timers` menu

This option allows to see a page showing the number of working hours, hours with active alarms, stand by hours.

1) In the program page (⇨11.1), turn counterclockwise the knob scrolling down until **`Show timers`**:

2) Press the knob, the **Show timers** menu is shown:

- **`working h.`**: number of hours with the equipment in normal operation
- **`alarm h.`**: number of hours with the equipment showing alarms
- **`Stand-by h.`**: number of hours with the equipment in stand-by mode

3) To quit this menu and go back to the program page, press the knob (see note).

Step 3 – If you have set some settings with the other menus of the program page, don't forget that they aren't still stored until you select the option **`Confirm Changes`** *and press the knob.*

11.1.d `Set power saver` menu

This option sets a certain time in which the equipment automatically reduces its output power (e.g. during some hours in the night). You can set both the needed power reduction as well as the low-power time in which it will be automatically set.

1) In the program page (⇨11.1), turn counterclockwise the knob scrolling down until **`Set power saver`**:

2) Press the knob, the **`Set power saver`** menu is shown:

- **`For. Power %`**: proportional reduction of the forward power during the power saver time
- **`Start h.m`**: time in hours and minutes from which the power saver starts
- **`End h.m`**: time in hours and minutes to which the power saver ends
- **`Previous Menu`**: return to the program page

3) Move the cursor **>** to **`For. Power %`** (see the previous image). Press the knob to move the cursor on the right.

4) Turn the knob to set the reduction percentage and press the knob to enter the set value (see the note at the bottom).

5) To set the power saver starting time, move the cursor to the left of **`Start h.m`**:

6) Press the knob. The cursor will move on the right of the **`Start h.m`**:

7) Turn the knob to set the start time, then press the knob to confirm. The cursor will move back on the left of **`Start`**:

8) Move the cursor to the left of **`End h. m.`** in order to set the end time (see warning at the bottom).

9) Press the knob. The cursor will move on the right of the **`End h. m.`**:

10) Turn the knob to set the end hour, then press the knob to enter the settings and move back the cursor on the left of **`End h. m.`**

11) Select **`Previous Menu`** to go back to the program page (⇨11.1), then press the knob.

12) To confirm the entered settings, select **`Confirm Changes`** and press the knob (or, to quit the menu without changing the previous setting, select **`Ignore Changes`** and press the knob). See the following warning.

Step 4 - when the value is shown as a percentage, this is related to a logarithmic scale. This means, for example, that by setting "50" the actual forward power value will be about ¾ of the rated power level (E.G.: 3750W with Archimede 5000).

Steps 7 and 10 – the start and end time are in 24 hours format. In the over stated example it will start from 1:10 A.M. and will end to 2:19 A.M.

Step 7 - the ending time (`End h.m`) must be subsequent to the starting one (`Start h.m`), otherwise the power saver time will start at the ending time and will end at the starting hour.

Step 11 - The `Previous Menu` command doesn't save any settings, so after it the `Confirm Changes` command must be mandatorily used.

11.1.e `Set a new password` menu

The default password to access the **`Set Function, Size`** menu is `000000`. For a better security, it's recommended to change it as follows (see notes and warnings at the bottom).

1) As explained on par. 11, after accessing **`Set Function, Size`** menu with the correct password, the display will show:

2) To set a new password turn the knob. The following menu will be shown:

3) The cursor **Λ** points the first digit of the password. Turn the knob to set the new value for this digit, then press the knob to enter it and move the cursor **Λ** underneath the second digit:

4) Repeat the last step until all the six digits has been set.

5) press the knob to enter the whole new password. The display will lead to the main menu.
6) Note down the new password in a secure place.

Don't forget to note down the new password, otherwise you won't be able to access again the Set Function, size menu. To recover a forgotten password, please contact Italab Technical Support.

In case you forgot the new password, to recover it please contact Italab Technical Support.

12 MAINTENANCE AND WARRANTY

12.1 Maintenance

Strictly follow what is written in this chapter.

12.1.a Clogging by dust

Since the equipment is air cooled, it is subject to clogging by dust. Because of its high-quality materials and manufacturing, if it's installed according to the instructions in Chapter 7, it won't require special maintenance for quite some time.

A regular service routine, mainly to remove internal dust from the front ventilation grid [4], is recommended over a 4 to 6 months intervals.

12.1.b Cooling fans

It is recommended to change the cooling fans at 5 year intervals, especially in higher temperature environments. Always use the same high quality type. It is recommended to clean the fans whereas earth or dust are available on the blades.

12.1.c Periodic overhaul

After a few years of continuous service, it is advisable to have the equipment overhauled in our factory or in an appointed laboratory, where its operation can be checked against the initial parameters. In addition, any necessary maintenance operations can be carried out.

It is also particularly important to overhauled the equipment when it has been working at high temperatures, over 30÷35°C.

Never change the original settings when the necessary, complex testing equipment and standard calibration are not available.

12.2 Warranty

Like all Italab solid state equipment, this equipment carries a one year guarantee on all its components with the exclusion of the final R.F. power module, which may be damaged by faulty output connections.

Notes:

- The above warranty is null and void if the equipment is tampered with or if failure is due to improper use or maintenance, or external causes, such as AC power line overvoltage
- The guarantee is valid only for repairs at our laboratories or at our appointed representative
- The goods shall be delivered carriage prepaid to the laboratory and it shall be returned freight forward
- This guarantee does not cover any consequential damage due to non-operation or faulty operation.

13 TROUBLESHOOTING AND ALARMS

If all instructions described in this manual are followed, the equipment will guarantee several years of perfect service. However, should problems arise, see this chapter before contacting the local authorized assistance point.

13.1 Types of alarms and relevant LED information

In case of alarm the **ALARM** LED [11] will glow red.

During the operation, two kinds of alarms could happen: non critical alarms (e.g. heatsink temperature between 90 and 99°C) and critical alarms (e.g. heatsink temperature over 99°C).

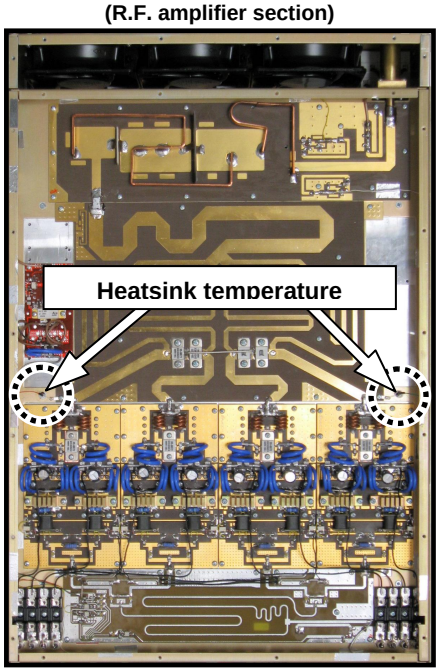
- **Non critical alarms** - the **ON** [9] and **ALARM** [11] LEDs are glowing and the STAND-BY LED is off. In this condition the equipment can go on working.
- **Critical alarms** - the **ON** LED is off and the **ALARM** and **STAND-BY** [10] LEDs are glowing. In this condition the equipment automatically gets into stand-by mode and the LCD display shows the active alarm name.

The alarm types are:

- **Reflected power over threshold** - the factory-set threshold depends on the model (**Archimede 3000**: 200W / **Archimede 4000**: 250W / **Archimede 5000**: 300W). When reaching this value, the equipment reduces its output power in order to keep the reflected power below the threshold. If the reflected power exceeds the threshold, the amplifier automatically gets into **stand-by** mode (**STAND-BY** LED starts glowing).
- **Heatsink temperature over threshold** – the equipment mounts on the heatsink two temperature sensors (see the image here below), the average of their values sets the “measured heatsink temperature”. if this value exceeds the 90°C threshold, the **ALARM** LED glows, but the unit keeps still working. If the temperature reaches 100°C, the **ALARM** LED keeps glowing and the equipment gets into **stand-by** mode (**STAND-BY** LED starts glowing).
- **Environmental temperature over threshold** – on the internal side of the front panel there is a temperature sensor in TO220 case which measures the environmental temperature. If this temperature exceeds 45°C the amplifier reduces its output power according to the internal temperature. If the environmental temperature exceeds 55°C, the equipment automatically gets into **stand-by** mode.
- **Direct Power under threshold** – This alarm becomes active if the output power goes under the user set level (⇨Par.8.1.b).

*All alarms are auto-resettable. This means that if an alarm ends (and there are no other active alarms) the **ALARM** LED stops glowing and, if the equipment was in stand-by status due to a previous active alarm, the amplifier status automatically reverts from the stand-by mode to the operation one.*

Equipment bottom view
(R.F. amplifier section)



14 TECHNICAL FEATURES

Feature	Archimede 3000	Archimede 4000	Archimede 5000
Frequency range	87.5 ÷ 108MHz		
Modulation	FM		
Input power	35W MAX	50W MAX	60W MAX
Output power	0 - 3000W	0 - 4000W	0 - 5000W
Spurious emissions	< -80dB		
Harmonics emissions	< -75dB		
Asynchronous AM S/N ratio	> 65dB, ref 100% AM 400Hz		
Synchronous AM S/N ratio	> 60dB, with FM @ 57kHz, 400Hz		
R.F. output connector	7/16” female*	7/8” EIA flange	
R.F. input connector	N type		
Monitor connector	BNC		
Operating temperature range	from -10 to +45°C		
Relative humidity	90% MAX		
Power supply	single-phase $230V_{AC}$/50 – 60Hz **	single-phase $230V_{AC}$, three-phase $220V_{AC}$, three-phase with neutral wire $400V_{AC,}$ 50 – 60Hz	
Dimensions	19” 2 units rack, 500mm depth		
Weight	28kg		35kg
Efficiency	77%		
Cooling system	Forced ventilation, CPU controlled. Input/output air temperature difference: 15°C		

*7/8” flange on demand

** Three-phase with neutral wire $400V_{AC}$ on demand

The above specifications might be changed without prior notice.

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16 ELECTRICAL, MECHANICAL DIAGRAMS AND PARTS LOCATION

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Figure 1 – Archimede High Power series Front view

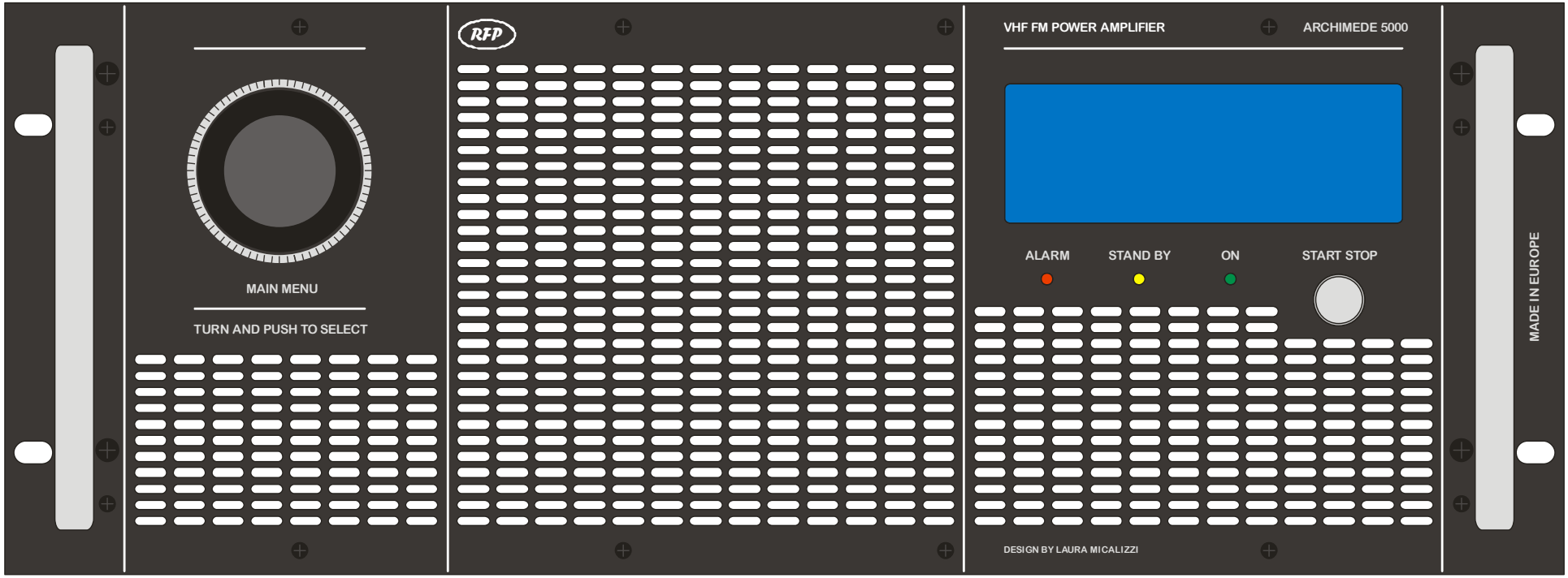


Figure 2 – Archimede 3000 and Archimede 4000 Rear view

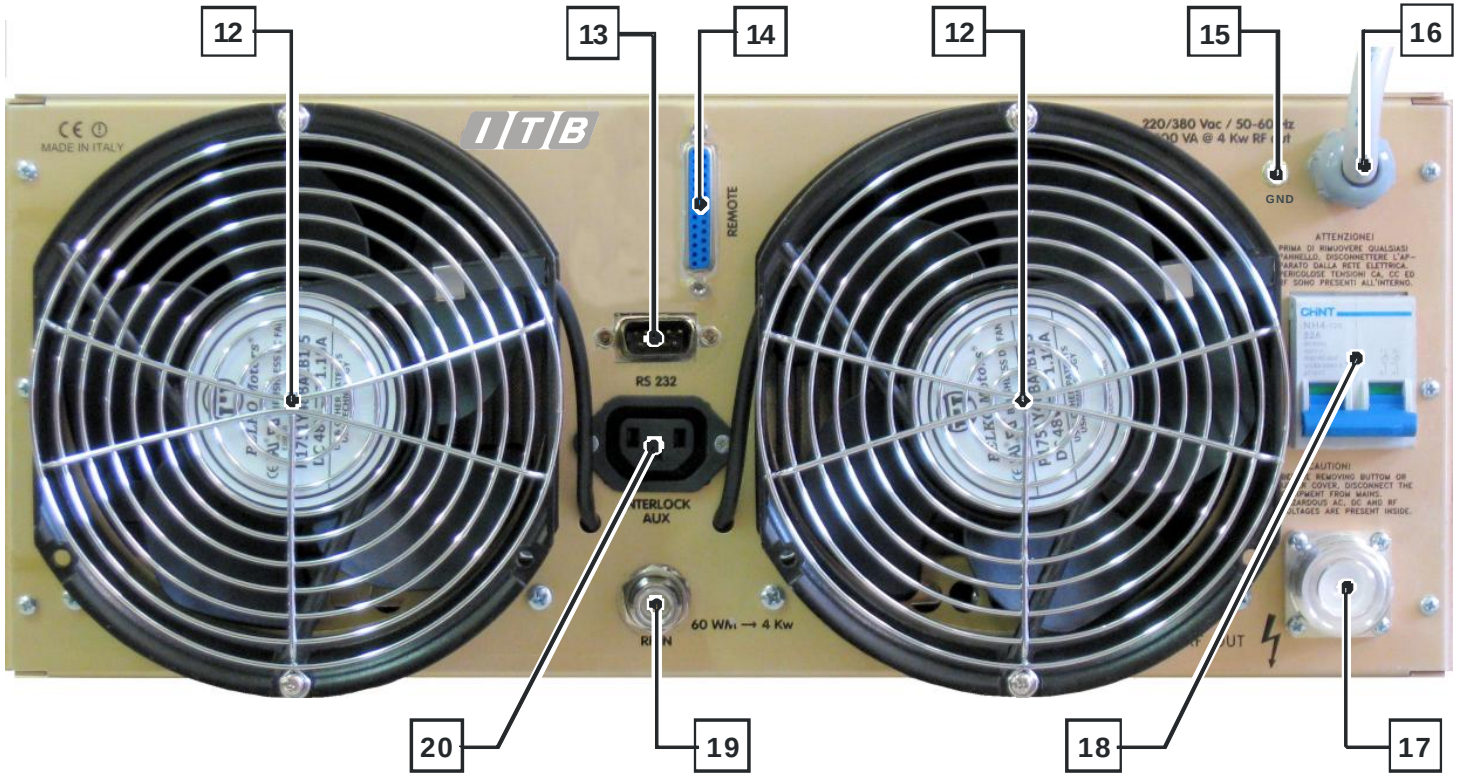


Figure 3 – Archimede 5000 Rear view

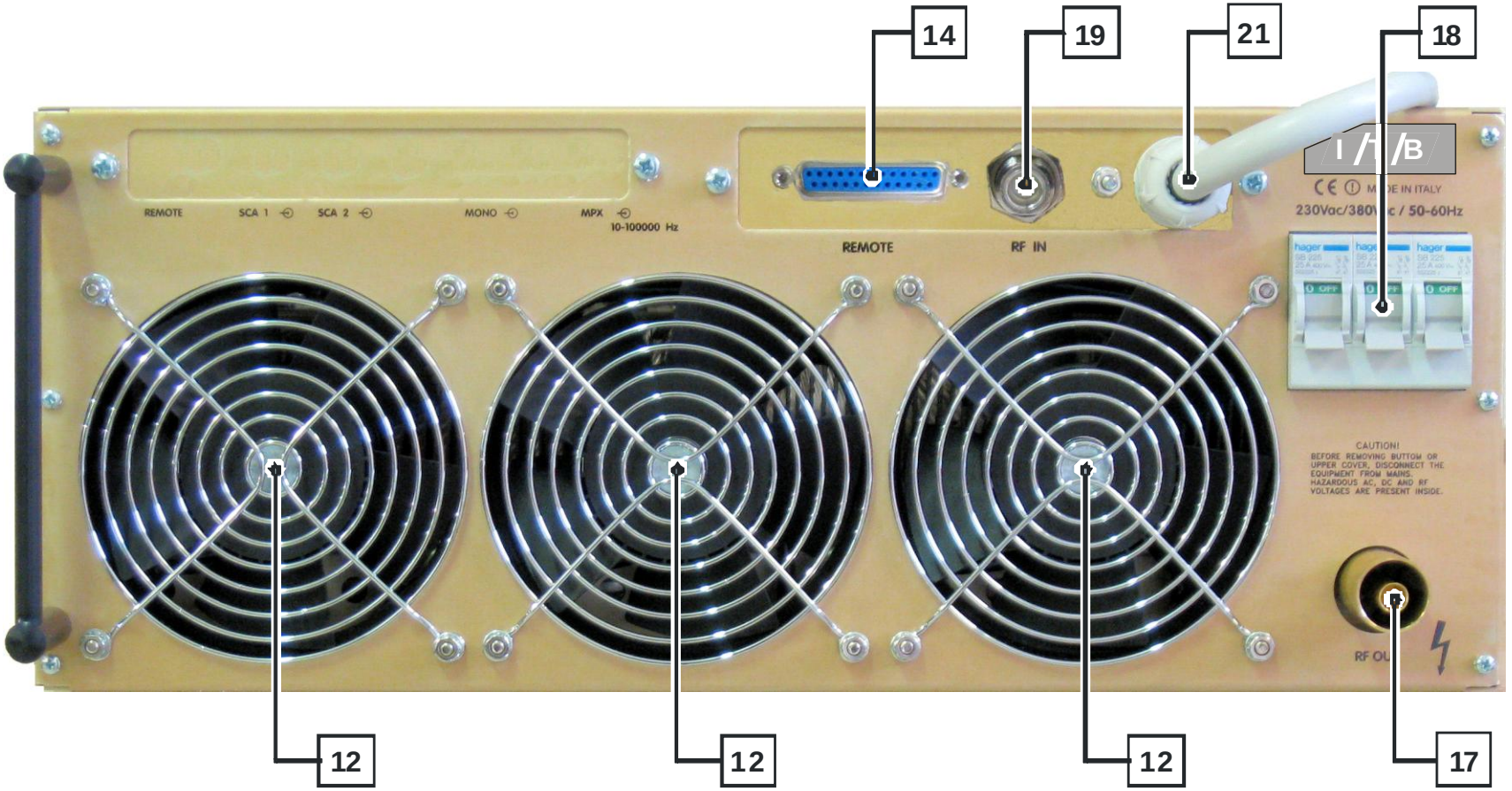
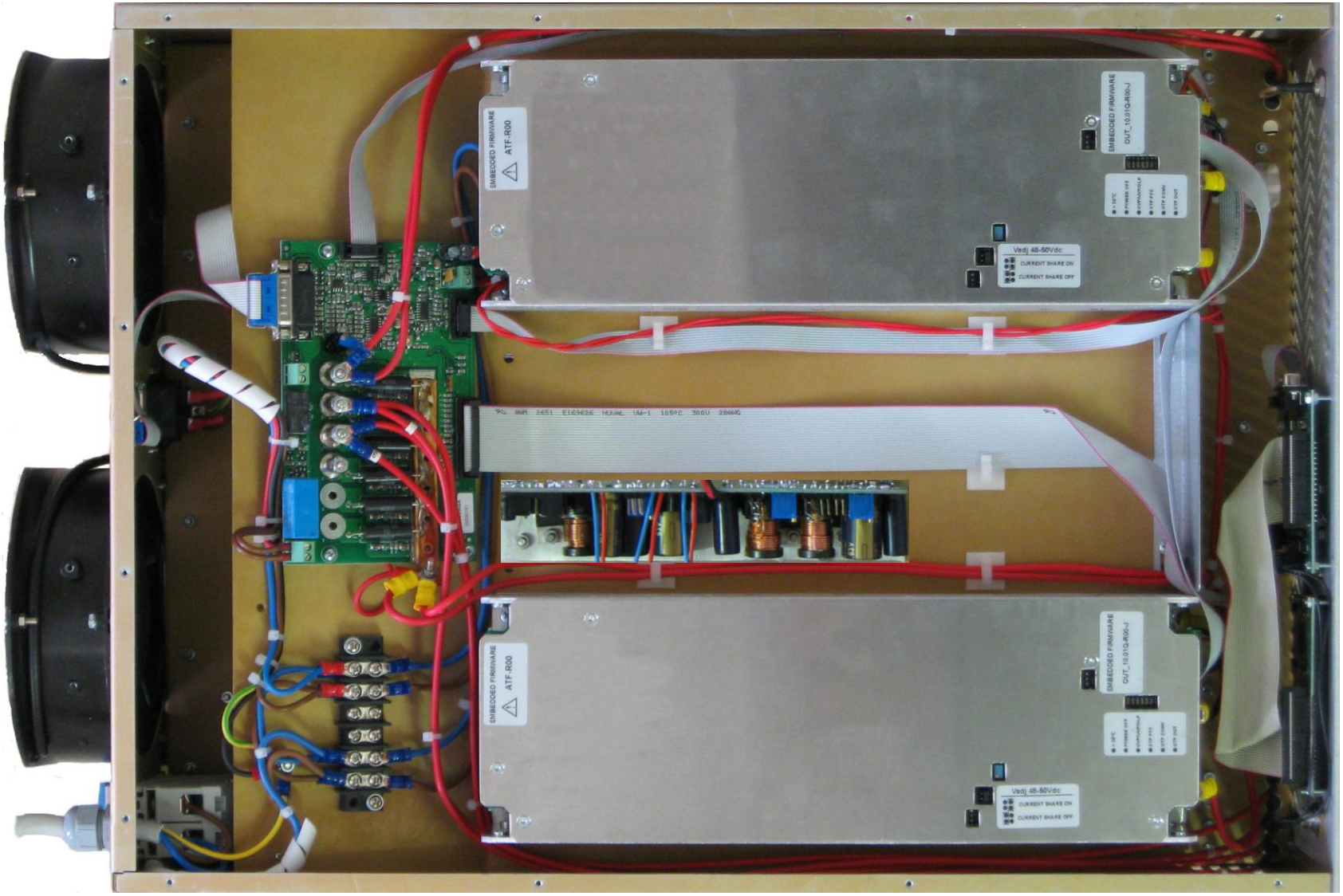


Figure 4 – Archimede 3000/4000 Top view (open)



Note: Archimede 4000 standard version mounts a third power supply unit, located in the central position (between the two shown power supply units)

Figure 5 – Archimede 5000 Top view (open)

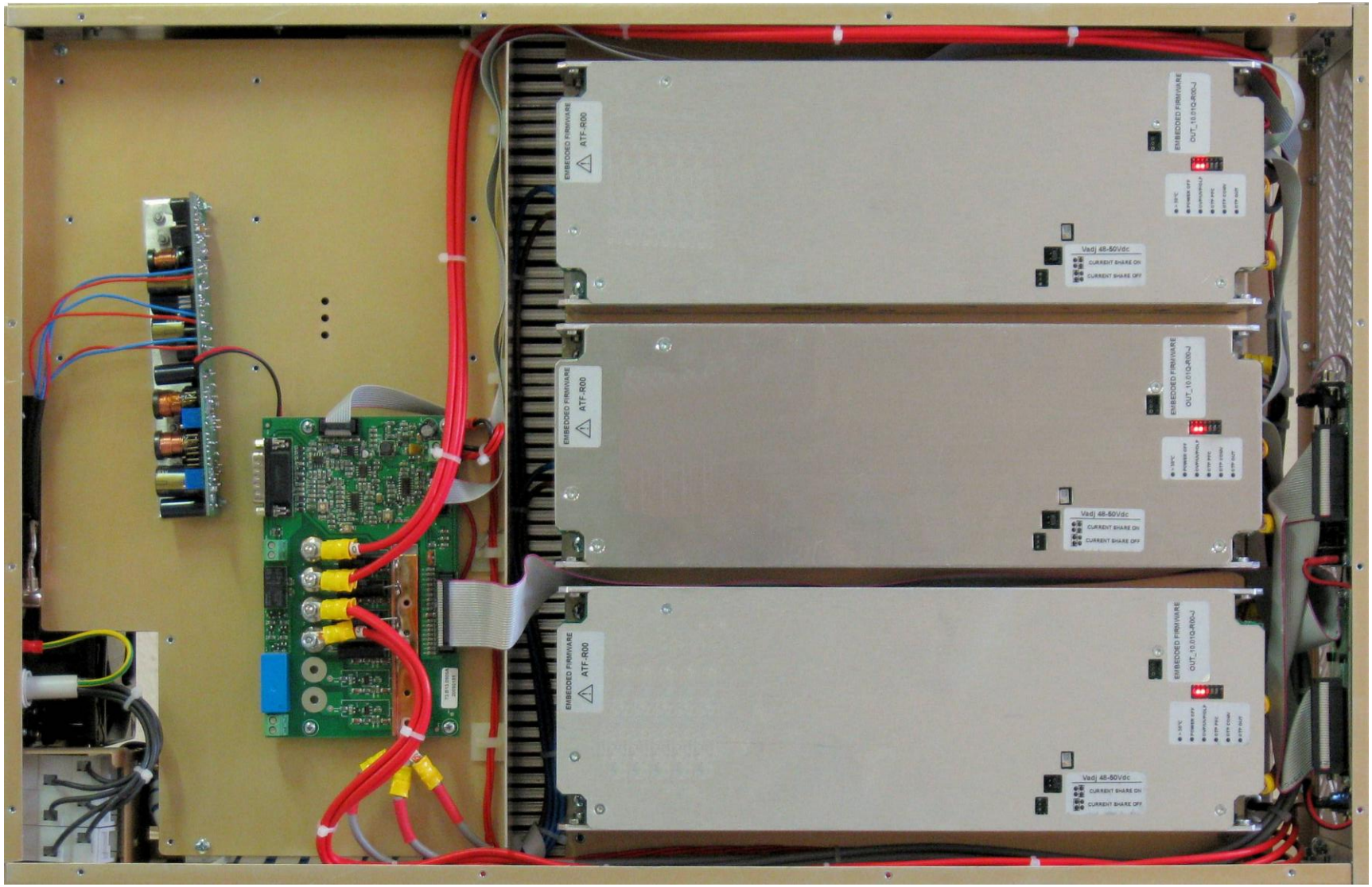
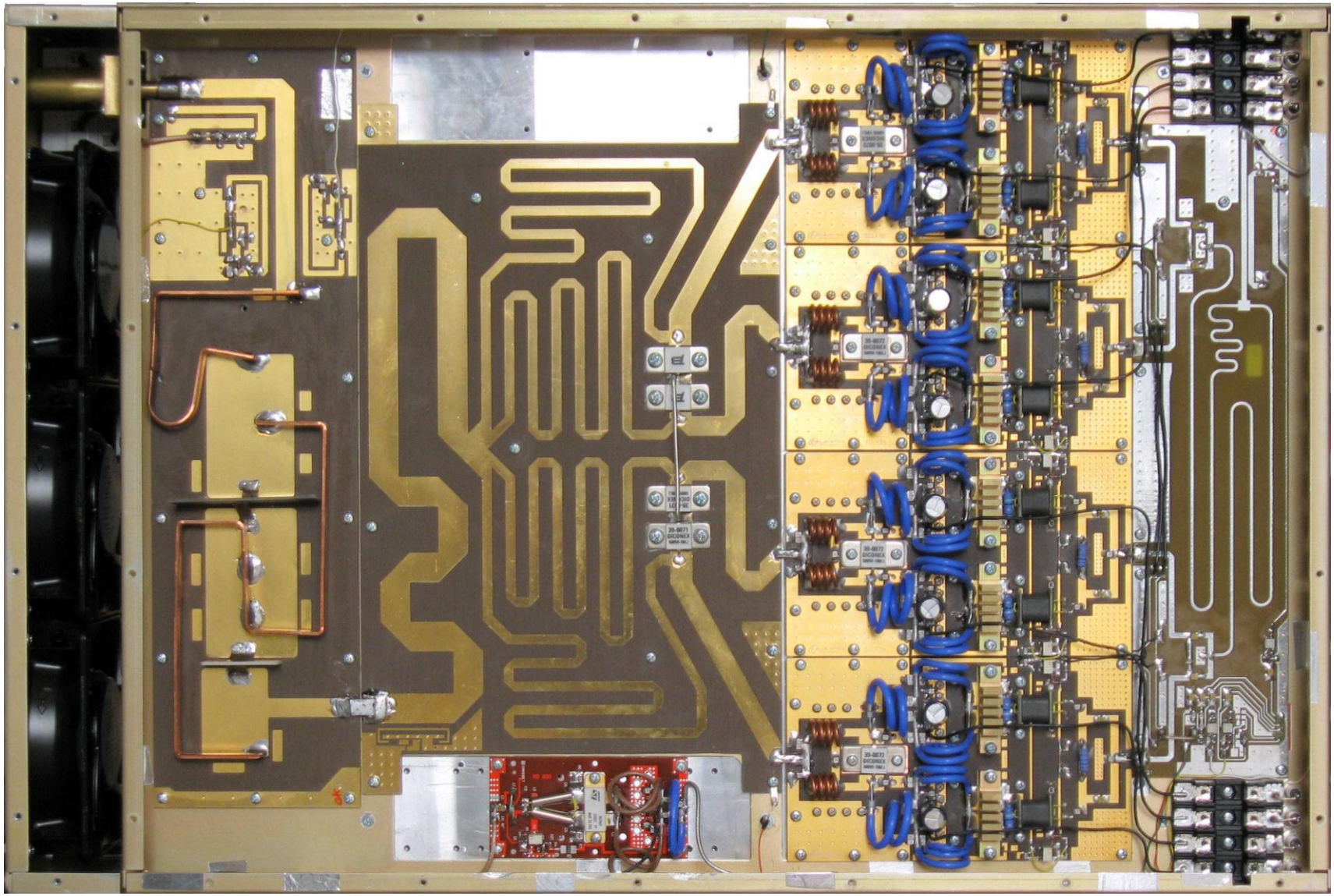


Figure 6 – Archimede High Power series Bottom view (open)



Note: the fourth amplifier module (the lowest in this image) is mounted only on Archimede 4000 and Archimede 5000. For details about the R.F. Amplifier section differences among the three models ⇨ 6.4

Figure 7 – Power Supply unit – Circuit diagram 1/7

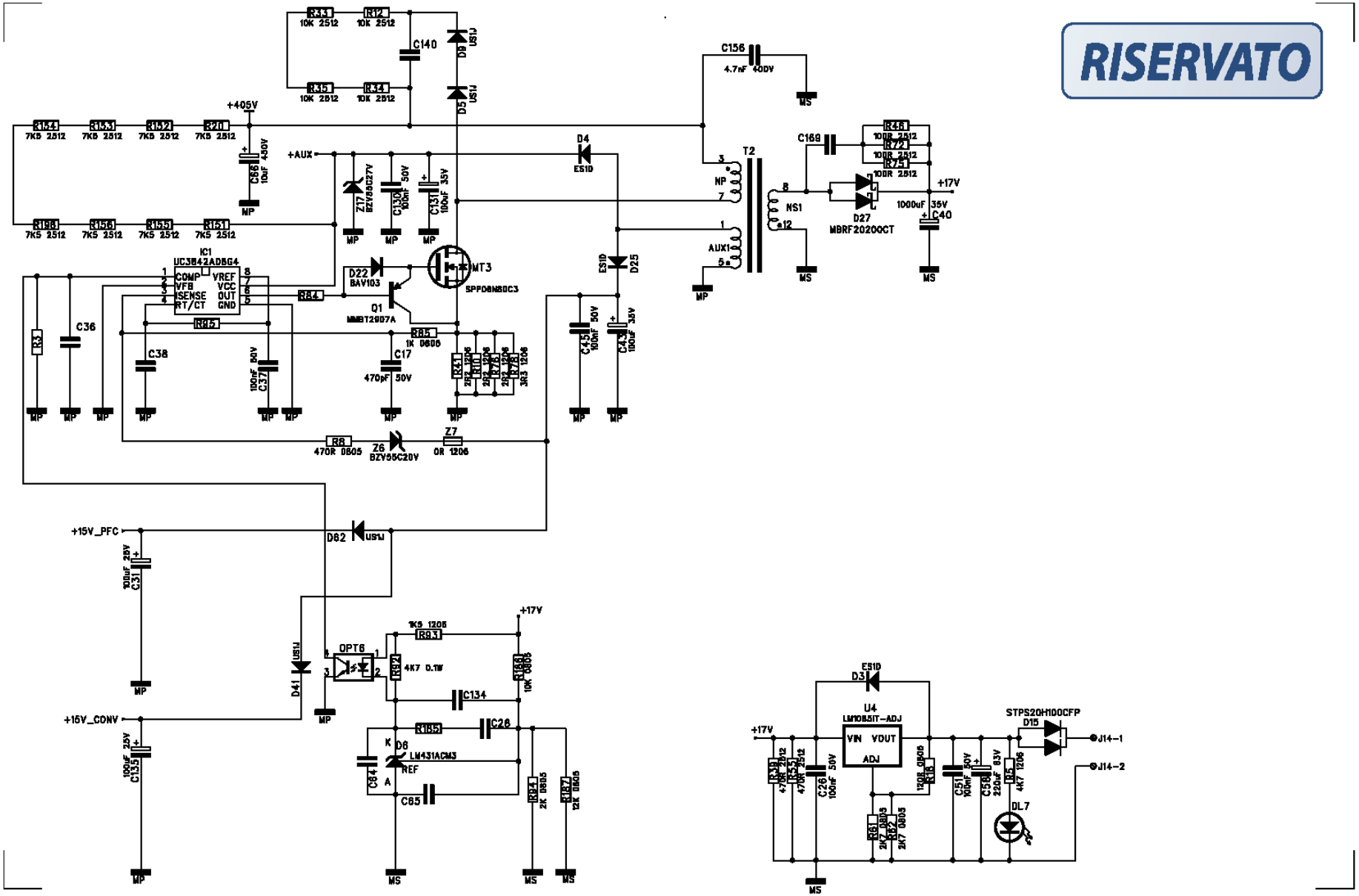


Figure 8 – Power Supply unit – Circuit diagram 2/7

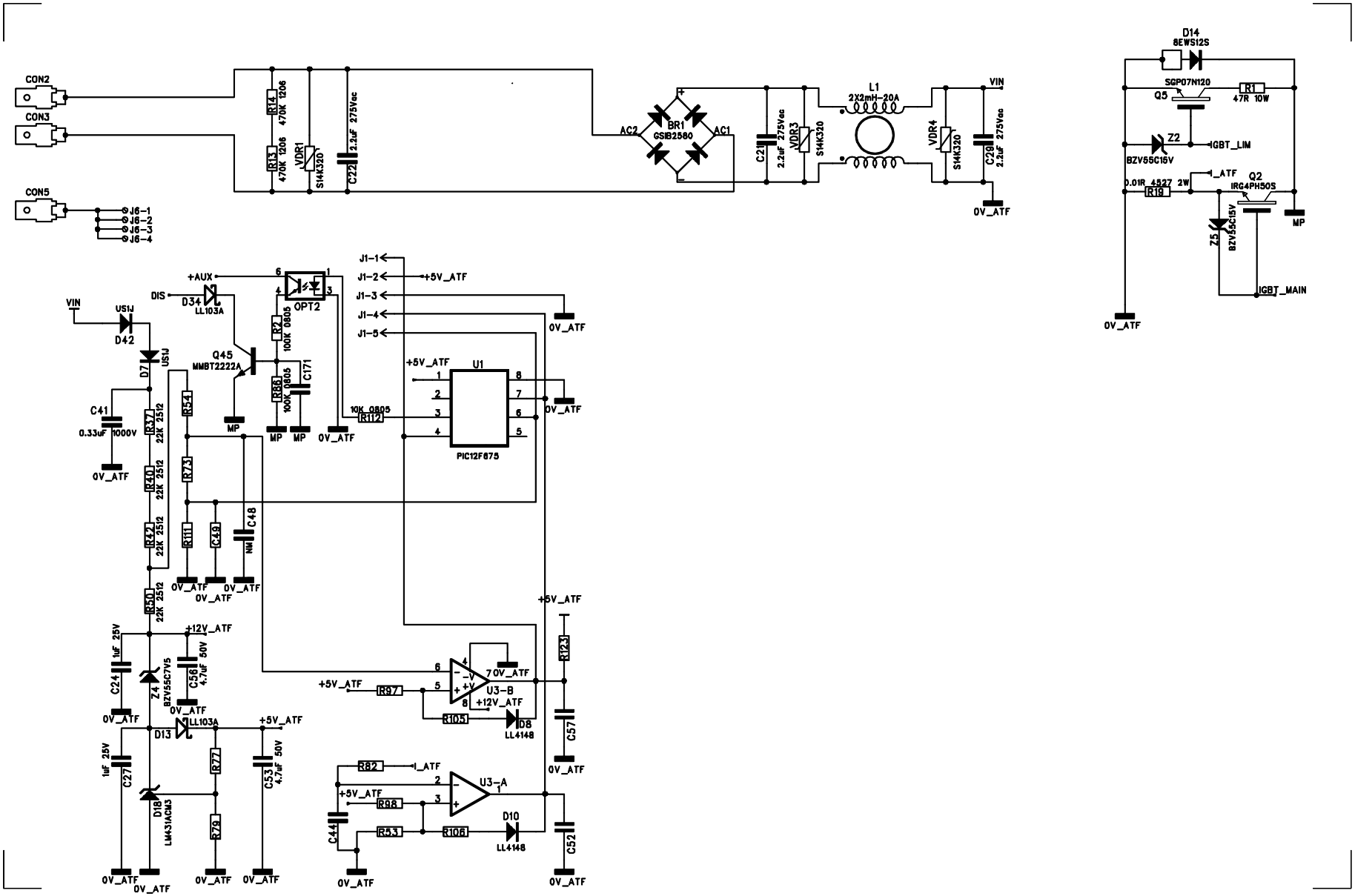


Figure 9 – Power Supply unit – Circuit diagram 3/7

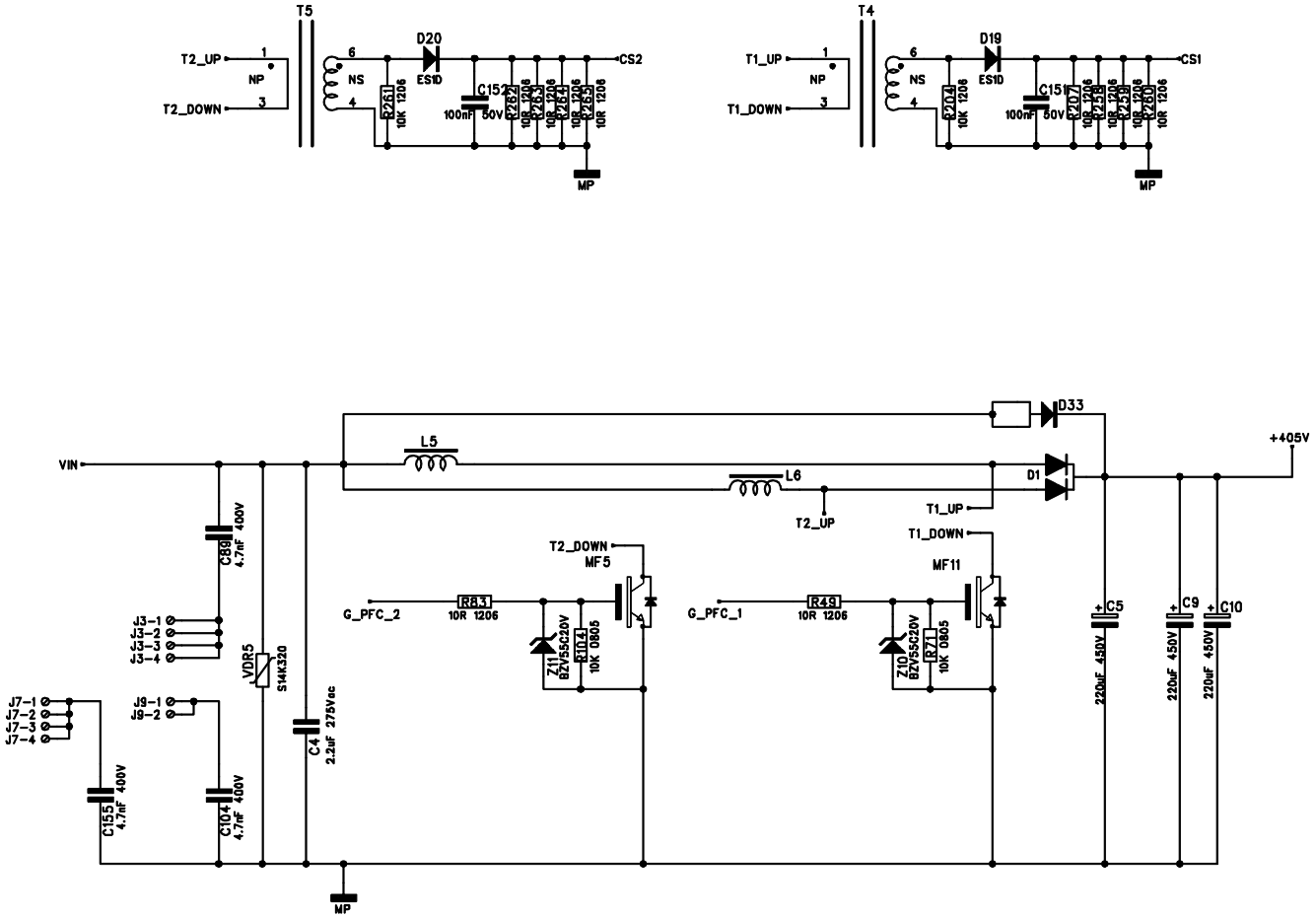


Figure 10 – Power Supply unit – Circuit diagram 4/7

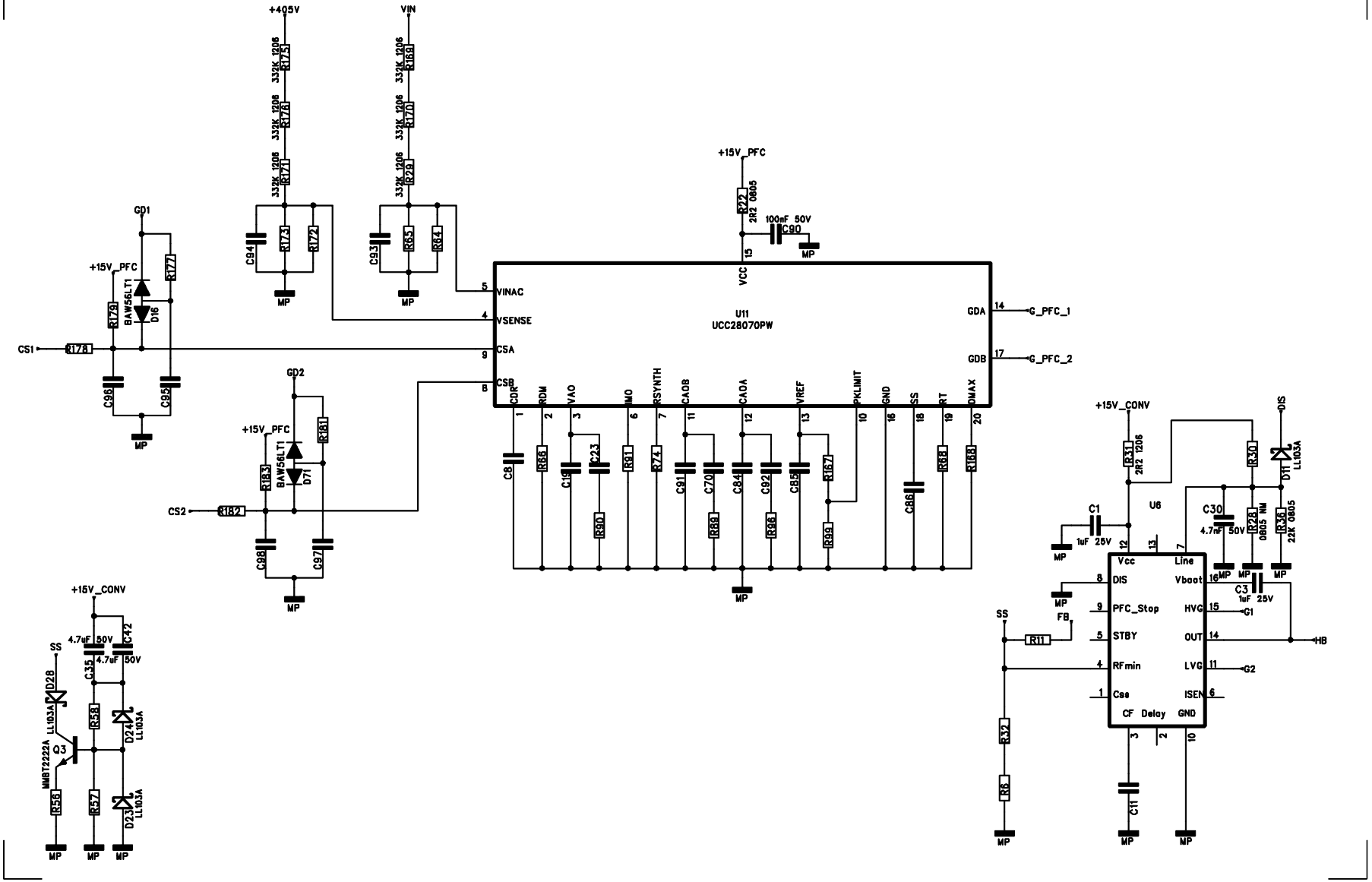


Figure 11 – Power Supply unit – Circuit diagram 5/7

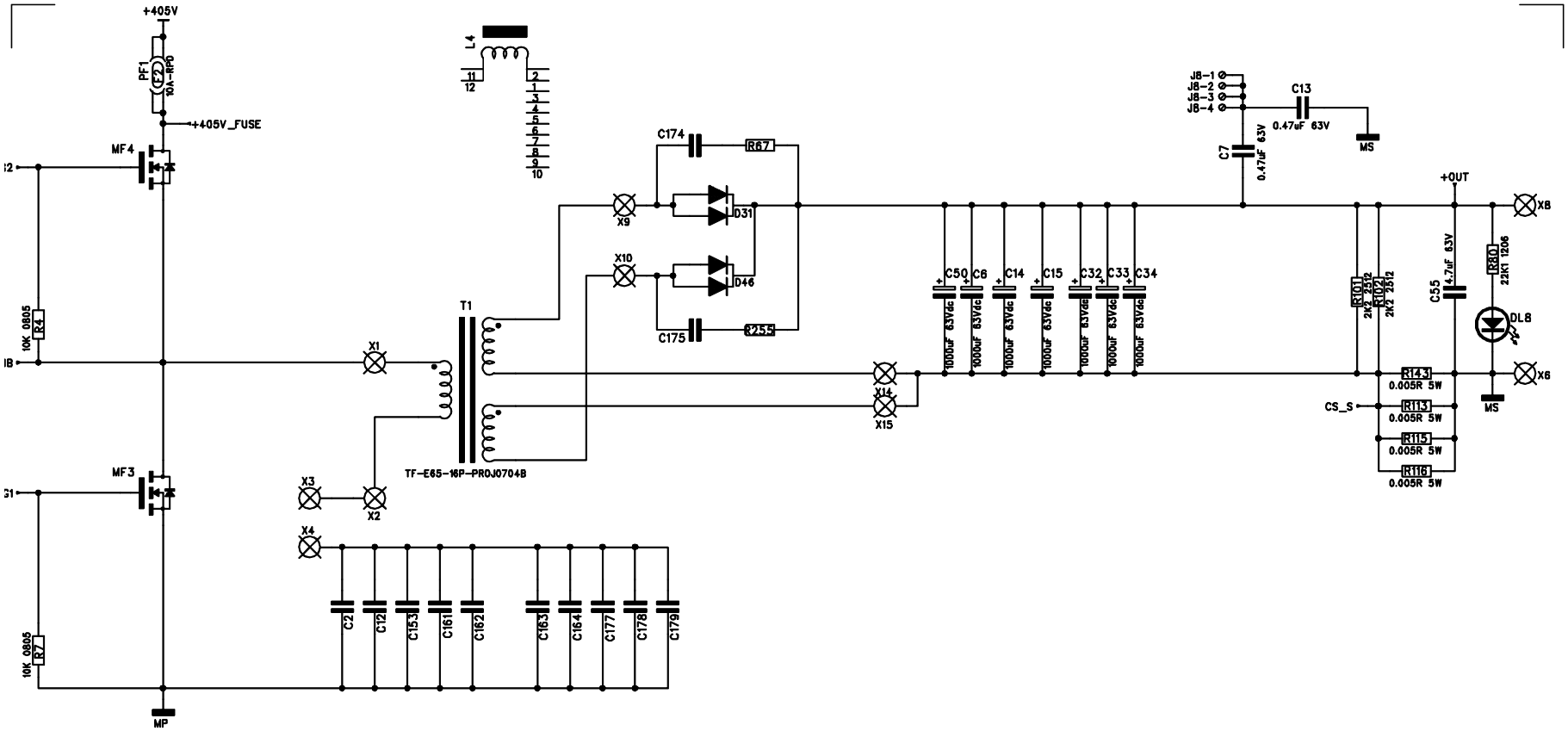


Figure 12 – Power Supply unit – Circuit diagram 6/7

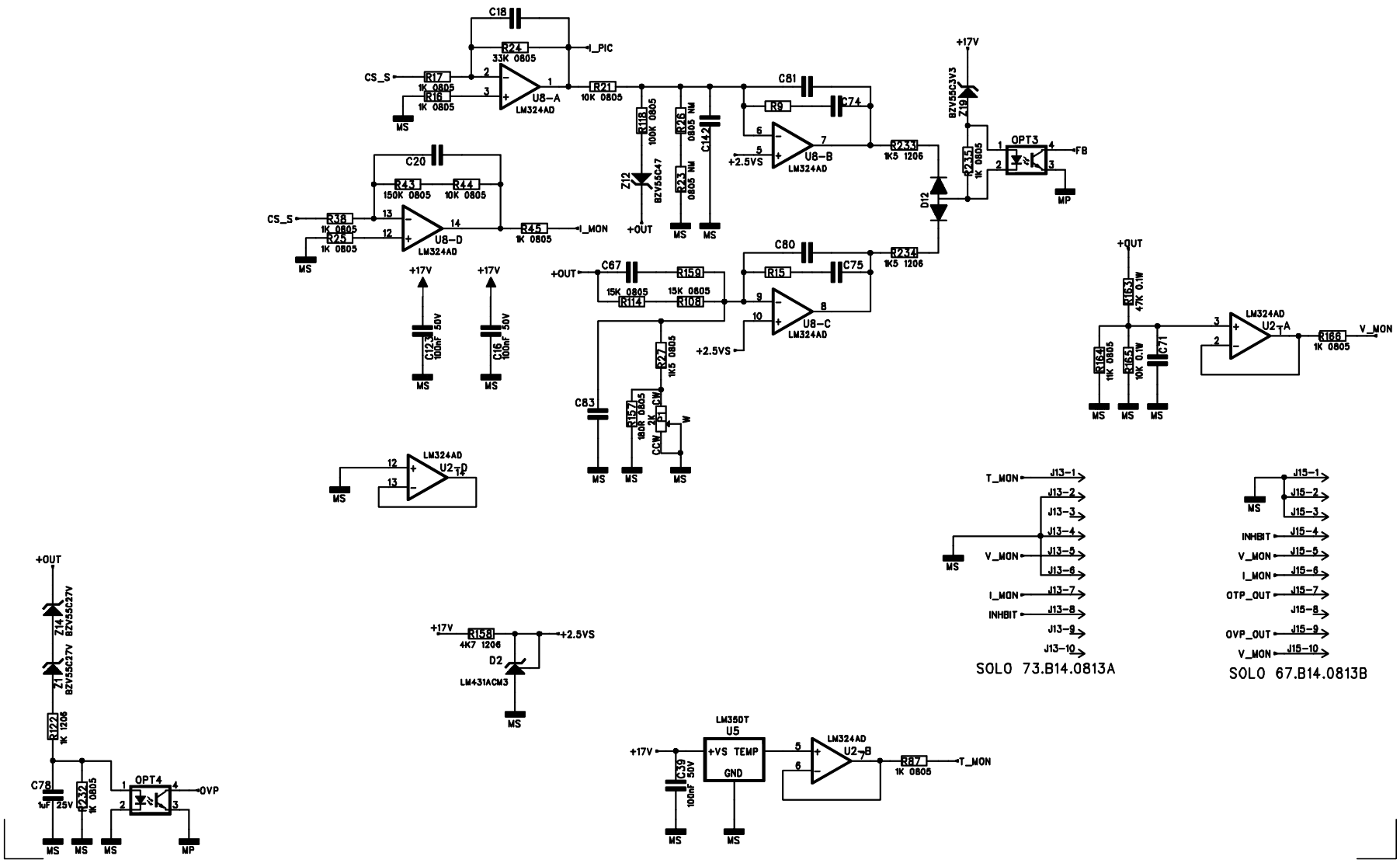
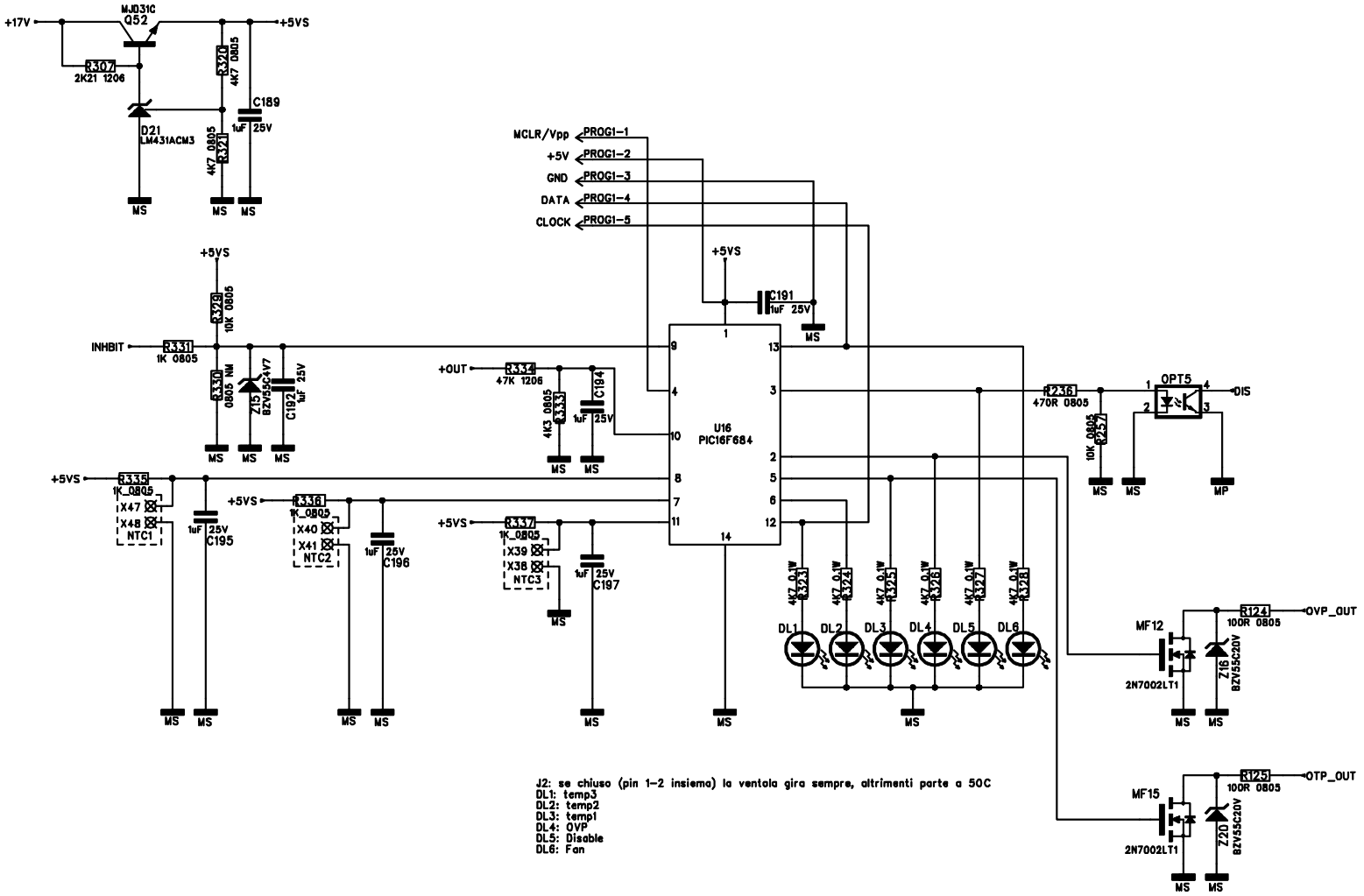


Figure 13 – Power Supply unit – Circuit diagram 7/7



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